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SCHIMMER (FRIEDA C.). **Alternaria brassicicola on summer Cauliflower seed.**—*Plant Path.*, 2, 1, pp. 16–17, 1 pl., 1953.

Each year since 1950 the inflorescences, pods, and seeds of summer cauliflower seed crops growing under glass at Wye College, Kent, have been severely attacked by *Alternaria brassicicola* [cf. *R.A.M.*, 31, pp. 224, 541; 32, p. 462]. Seed infection was 96 to 100 per cent. in 1950, 31 per cent. in 1951, and 63 to 77 per cent. in 1952. On germination in a moist chamber the seedlings developed characteristic black, necrotic streaks and spots on the cotyledons and stems, and were rapidly overgrown by the fungus and died. Seeds sown in John Innes compost were much less severely affected, but frequently displayed the 'wire stem' effect [ibid., 25, p. 244]. Hot water treatment at 122° F. for 18 minutes reduced infection to 1 per cent. in 1950 and nil in 1951 and 1952.

It was repeatedly observed at Wye that dying parts of the flower heads readily became colonized by the fungus, thus providing a source of inoculum close to the developing fruit.

STEUDEL (W.). **Zur Frage der Bekämpfung der Vergilbungskrankheit der Beta-Rüben durch Überträgerabtötung mit chemischen Mitteln. I. Die Wirkung des Präparates 'Systox' auf die Blattlauspopulation der Beta-Rüben.** [On the question of the control of *Beta* Beet yellows disease through vector extermination with chemical remedies. I. The influence of the preparation 'systox' on the aphid population of *Beta* Beets.]—*Z. PflKrankh.*, 59, 11–12, pp. 418–430, 17 graphs, 1952. [English summary.]

A tabulated account is given of large-scale experiments at Elsdorf, Rhineland, in 1950 and 1951, on the control of beet yellows virus [see above, p. 528 and next abstracts] through extermination of the aphid vectors (*Myzodes* [*Myzus*] *persicae*) and *Doralis* [*Aphis*] *fabae* by spraying with systox [*R.A.M.*, 31, p. 349] at the rate of 400 to 800 ml. in 600 to 800 l. water per ha. The initial effect of the treatment was adequate, but its permanence depends on the provision of the essential biological conditions, e.g., early drilling in very close rows to prevent the mass invasion of individual plants, which is not influenced by systox. One early summer insecticidal treatment will largely forestall the development of winged migrants, but in western Germany two to three applications during June and July are necessary to check the formation of numerous colonies, especially on late-sown crops.

HIRSCHFELD. **Beobachtungen über die Vergilbungskrankheit bei Rüben.** [Observations on the yellows disease in Beets.]—*Mitt. dtsch. LandwGes.*, 67, 52, pp. 997–998, 1952. [Received June, 1953.]

Observations are presented in connexion with an outbreak of beet yellows virus of unprecedented severity which occurred in North-Rhine and Westphalia, Germany,

in 1952 [see preceding abstract]. The sugar content of beets delivered at a factory was only 10 to 13 per cent. It has been noticed repeatedly during the last few years in the Cologne-Aachen inlet that beets growing on loess loam soils containing bomb and grenade debris are free from yellows, appearing like oases in an infested field. Similarly, the beets on a strip of ground, 150 by 1 m., covering the site of a trench showed no sign of infection in 1950, though surrounded by thoroughly diseased plants. The average weights per root were 1·18 kg. in the trench and 0·47 kg. in the rest of the field and the sugar contents 17·7 and 19·6 per cent., respectively, while the leaf yield was estimated to be three times as high at the former site.

At a large undertaking in the Cologne district in 1949 one plot of beets was preceded by potatoes, another by a mixed crop of beans [? *Vicia faba*] and oats, and a third by chicory. In the first two plots the plants sustained heavy damage from yellows, while in the third the leaves remained fresh and green. On the half of a plot supplied with a green manure of white clover the beets were in considerably better condition than those on the other half amended with stable manure. In various fertilizer experiments the untreated plants showed a much higher incidence of infection than the treated. In relation to the subject of fertilizers it is noteworthy that the sugar beet soils of North-Rhine have the lowest phosphoric acid and potassium contents of any in west and south Germany.

Ernould (L.). **Les ennemis et maladies de la Betterave, en Belgique, en 1952.** [Pests and diseases of the Beet in Belgium in 1952.]—*Publ. Inst. belge Amélior. Better.*, 20, 3, pp. 143–173, 1952. [Flemish and English summaries.]

During the period under review [cf. *R.A.M.*, 31, p. 415] beet crops in Belgium sustained heavy losses from beet yellows virus, especially in Hainault, Flanders, and the sandy loam regions of the country, the percentages of infection increasing progressively from 0·1 on 26th June to 26 on 15th July, 59 at the end of the month, 73 on 11th August, 88 on 1st September, and 99 in October.

In an experimental field at La Glanerie, Tournai, containing 80,000 sugar beet plants per ha., the percentages of beet mosaic virus on 4th and 28th July and 22nd August were 0·6, 1·1, and 33, respectively.

Bennett (C. W.). **Vein clearing on Sugar Beet induced by the Beet leafhopper.**—*Phytopathology*, 42, 10, pp. 535–537, 1 fig., 1952.

When non-viruliferous beet leafhoppers (*Circulifer tenellus*) [*Eutettix tenella*] from stock cultures or field collections feed on seedling sugar beet plants at the U.S. Sugar Plant Field Laboratory, Riverside, California, they occasionally induce a type of vein-clearing similar to that caused by beet curly top virus [*R.A.M.*, 32, p. 219]. Selection and mating of leafhoppers producing this effect resulted in the development of a strain in which more than half the individuals are capable of causing vein-clearing. The injury, usually confined to the side of the plant on which the leafhoppers are feeding, is apparently a sequel to retardation or inhibition of chlorophyll production in the cells adjoining the vascular bundles. It occurs exclusively on young, rapidly growing plants. The symptoms induced by one leafhopper seem to be as severe as those caused by as many as 20, and little difference in efficiency was observed between adult males, adult females, and nymphs.

Blair (I. D.) & Copp (L. G.). **Pea seed disinfection : a statistical study.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 5, pp. 397–404, 1953.

During several seasons' field and greenhouse trials with seed treatments of William Massey peas in New Zealand [*R.A.M.*, 32, p. 352], thiram (premasan) and 98 per cent. spergon (2 oz.) gave the best results over all sowing dates, increasing the field emergence by at least 15 per cent. In autumn sowings all treatments were

considerably better than untreated, but in midsummer some untreated sowings were as good as the treated. In glasshouse pot trials soil moisture had more influence on emergence than temperature [ibid., 32, p. 236].

BOTTINI (E.) & MARSELLA (R.). **Contributo allo studio del molibdeno come elemento micro-nutritivo.** [A contribution to the study of molybdenum as a micro-nutritive element.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1659–1681, 7 figs., 1952. [English summary.]

Pot tests conducted at the Stazione Chimico-Agraria Sperimentale, Turin, demonstrated that in concentrations ranging from 1 to 10 p.p.m. molybdenum markedly increased the root development of Mitscherlich dwarf peas and exerted a protective effect against the natural decomposition of the chlorophyll [cf. *R.A.M.*, 30, p. 112; 31, p. 576]. It was strongly toxic, however, to the other organs, and prevented the absorption of nutrients.

LUTTRELL (E. S.) & GARREN (K. H.). **Blights of Snap Bean in Georgia.**—*Phytopathology*, 42, 11, pp. 607–613, 1 fig., 1952.

The fungi primarily responsible for snap bean [*Phaseolus vulgaris*] blights in Georgia were shown by greenhouse and field investigations at the State Experiment Station to be *Macrophomina phaseoli* [*R.A.M.*, 26, p. 130], *Rhizoctonia* [*Corticium*] *solani* [ibid., 31, p. 416], and *Sclerotium rolfsii* [ibid., 27, p. 65]. A high percentage of ashy stem blight and leaf spot could be obtained at any time by inoculation of the shoots with conidia of *M. phaseoli*, severity increasing progressively with the age of the plants. Post-emergence soil inoculation tests gave negative results. Charcoal rot (the early phase of the disease), which caused heavy damage in soil inoculated before planting, was completely controllable by seed treatment with 2 per cent. ceresan. The inoculation of unsterilized field soils with *M. phaseoli* caused only slight infection, but *C. solani* and *S. rolfsii* were pathogenic in non-sterilized as well as in autoclaved soil. Beans were highly susceptible to *S. rolfsii* at all ages but resistance to *C. solani* increased with advancing maturity. Seed treatment did not result in practical control of the blights in field trials, but observations denote that they may be avoided by early sowing.

WALTERS (H. J.) & STARR (G. H.). **Bacterial diseases of Beans in Wyoming.**—*Bull. Wyo. agric. Exp. Sta.* 319, 12 pp., 7 figs., 1952.

The symptoms, control, and geographical distribution of four bacterial diseases of snap beans [*Phaseolus vulgaris*: *R.A.M.*, 32, p. 5] in Wyoming are briefly described.

SĂVULESCU (T.). **Le mildiou du Soja.** [Mildew of Soy-Bean.]—*Bull. Sect. sci. Acad. roum.*, 30, 8, 6 pp., 1 pl., 1948. [Received 1952.]

Investigations on soy-bean diseases in Rumania have shown that seed-transmitted virus diseases reduce the yield from between 1,000 and 1,500 kg. per ha. to 300 to 400 kg. In August, 1946, downy mildew [*Peronospora manshurica*: C.M.I. map No. 268] was observed on all the local varieties. Two applications of 2 per cent. Bordeaux mixture, one just before flowering and the other nine to 12 days later, gave good control under local conditions provided the lower leaf surface was thoroughly wetted.

SHERWIN (HELEN S.) & KREITLOW (K. W.). **Discoloration of Soybean seeds by the frogeye fungus, Cercospora sojina.**—*Phytopathology*, 42, 10, pp. 568–572, 1 fig., 1952.

At the Plant Industry Station, Beltsville, Maryland, conspicuous discolorations

designated 'grey', 'brown', or 'papillate' were detected in samples of soy-bean seed grown in Illinois, Louisiana, Maryland, Mississippi, and Virginia. They were due to the frog-eye fungus, *Cercospora sojina* [*R.A.M.*, 32, p. 166], and differed markedly from the purple stains caused by *C*[*ercosporina*] *kikuchii* [loc. cit.]. Surface sterilization of infected seeds for 20 minutes in 1 in 500 mercuric chloride in 50 per cent. ethanol did not eliminate the fungus completely.

In greenhouse and field tests the germination of seeds discoloured by *Cercospora sojina* was significantly lower than that of clean ones, while many of the seedlings that did emerge bore lesions on the cotyledons and developed premature foliage infection in the field. On the other hand, seeds infected by *Cercosporina kikuchii* germinated normally and produced stands comparable to those from clean ones. Pod inoculation with *Cercospora sojina* resulted in the development of the typical seed discolorations, which tended to increase progressively when the plants were left standing after reaching maturity.

Dye (D. W.). **Control of soft-rot (Erwinia carotovora (Jones) Holland) in Carrots during transit and in storage.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 5, pp. 465–467, 1953.

Lack of general provision for refrigeration during transit and in store in New Zealand results as a rule in extensive losses of carrots due to attacks of bacterial soft rot (*Erwinia carotovora*) [*R.A.M.*, 30, p. 361]. Three tests with various compounds to determine the value of post-harvest treatment of carrots in reducing these losses were carried out at the Department of Scientific and Industrial Research, Auckland. Bordeaux mixture (6–8–100 and 12–16–100), cuprox (3 and 5 lb. per 100 gals. water), copper sandoz (2½ and 5 lb.), perenox (5 lb.), and exposure to bright sunshine reduced infection very significantly. There were from 81 to 97 per cent. clean, edible carrots after 14 days' storage as against 43 and 57 per cent. for the untreated inoculated controls. After 21 days' storage the figures were 90 to 96 and 71 per cent. Copper zeolite (5 and 12 lb.) also gave a significant reduction of infection (82 and 85·6 per cent. edible carrots after 14 and 21 days, respectively).

No treatment seriously affected the market appearance and none imparted any detectable taint to cooked roots.

Whenever soft rot infection is expected, particularly in heavily infected areas during wet or humid weather, post-harvest treatments should be applied, preferably during transit or in store, bagged carrots being dipped in one of the copper solutions at the lower concentration tested.

Lelliott (R. A.). **A new bacterial disease of Leeks.**—*Plant Path.*, 1, 3, p. 84, 1 pl., 1952.

In June, 1949, leek flowering axes bearing long, water-soaked lesions were received from a farm near Canterbury and another in East Sussex. On the latter, where 27 acres of leeks were grown for seed, 10 per cent. of the stalks were affected, this figure reaching 50 per cent. later in the season. Severely affected stalks failed to set seed and the leaves bore spots. From the infected material a species of *Pseudomonas* related to *P. coronafaciens* and to *P. berberidis* was isolated, which on excised pieces of flower stalk produced symptoms resembling those seen in the field. Young leeks sprayed with this isolate developed long streaks on the leaves and withered tips, and the bacterium was recovered.

In July, 1951, 25 per cent. of the East Sussex crop bore small, sometimes confluent, circular, olive green, water-soaked lesions 2 to 15 mm. in diameter, the larger of which had pale brown centres. Larger, pale brown to brown lesions up to 25 cm. long, with olive green edges, sometimes girdled the stem but were generally confined to one side of it. Looped and crank-shaped distortions of the stalk

commonly occurred. No lesions were apparent on the leaves. A species of *Pseudomonas* was isolated. Inoculations of wounded stalks, and of one of three unwounded stalks protected after inoculation by a plastic envelope, gave, after 21 days, lesions of the larger type gradually passing into the smaller. The organism was reisolated from the affected parts. Further work is in progress.

Bant (J. H.) & Storey (I. F.). **Hot-water treatment of Celery seed in Lancashire.** —*Plant Path.*, 1, 3, pp. 81–83, 1952.

In 1949 and 1950 plot trials were carried out in Lancashire to compare the effectiveness of the hot water and formaldehyde treatments of celery seed severely infected with *Septoria* spp. [*S. apii* and *S. apii-graveolentis*: *R.A.M.*, 11, p. 91; 27, p. 59; 32, pp. 168, 359]. The seed, in hessian or muslin bags, was steeped for 25 minutes in water at 50° C., or for three hours in a solution of 1 part of 40 per cent. formaldehyde in 300 parts water, followed by drying. In 1949 the percentages of infected plants grown from clean, untreated seed and from seed with 25 per cent. infection which had received (*a*) no treatment, (*b*) hot water treatment, (*c*) formaldehyde, (*d*) formaldehyde followed by four or five Bordeaux sprays (4–6–50) during the growing season, and (*e*) Bordeaux sprays only, were, respectively, 3, 29, 5, 26, 3, and 19. In 1950, with 53 per cent. seed infection, the corresponding figures were 32, 78, 2, 83, 0, and 40.

In 1951, infection in Lancashire crops grown from seed given hot water treatment was confined to the Hesketh Bank area, where 11 of 35 crops were affected. In these fields there was 7 per cent. disease from seed infected before treatment and 8 per cent. from the clean seed, indicating that infection had come from some source other than the seed.

It is concluded that clean celery crops can be obtained from seed severely infected by *Septoria* spp. given only hot water treatment, if care is taken to prevent infection from outside sources. Treatment should be applied within one year of harvest, or it may cause reduction in germination.

Middleton (J. T.), Hall (B. J.), Wedding (R. T.), & Kendrick (J. B.). **Adaxial crack stem of Celery.**—*Phytopathology*, 42, 11, pp. 603–606, 2 figs., 1952.

The essential information in this paper on boron deficiency in celery in California has already been noticed from another source [*R.A.M.*, 32, p. 7 and next abstract].

Minges (P. A.), Yamaguchi (M.), Knott (J. E.), Spurr (A. R.), & Welch (J. E.). **Brown checking of Celery. Variety and relative accumulation of potassium and boron found to be factors affecting incidence of disease.**—*Calif. Agric.*, 6, 12, pp. 5–6, 3 figs., 1952.

During investigations on adaxial crack stem of celery due to boron deficiency in the presence of high potassium [*R.A.M.*, 32, p. 58 and preceding abstract] at the College of Agriculture, University of California, Davis, it was found that the selection of a resistant variety, such as Summer Pascal or Utah 52–70, is the best method of control. Reduction in potassium applications or treatment with boron sprays at appropriate intervals might be helpful.

Grogan (R. G.), Welch (J. E.), & Bardin (R.). **Common Lettuce mosaic and its control by the use of mosaic-free seed.**—*Phytopathology*, 42, 10, pp. 573–578, 1 fig., 1952.

Preliminary notes covering part of the information in this paper on lettuce mosaic virus control in California have already been published [*R.A.M.*, 30, p. 302; 31, p. 164], but this amplified version also contains a description of the comparatively little known symptoms in the Imperial and Great Lakes 'crisphead' types

[ibid., 28, p. 503] constituting the bulk of the acreage in the United States. The initial slight inrolling of the leaves and irregularity of the first true leaf are accompanied or followed by a pale green to yellow mottling, while vein-clearing and slight bronzing (due to necrotic flecking of the leaf blade) develop in the young rosette stage. In plants approaching marketable age the disease is characterized by severe stunting and a dull green to faint yellow discoloration, while the downward rolling of the outer leaf tips imparts a wilted appearance to the stand. Mottling is barely distinguishable, except perhaps near the leaf margins. The midribs protrude abnormally on the under side of the leaf, especially in the Great Lakes variety. The hypersensitive Imperial D and Eiffel Tower Cos react to infection by acute necrosis of the leaf blade, a symptom occasionally observed also in Imperial 615 and Great Lakes.

The local epidemiology of the disease is also discussed. At average seeding rates there is one plant harbouring seed-borne infection in every 4 ft. of bed before thinning, but serious damage does not result until secondary spread by aphids takes place. In the Imperial Valley, where the crop is planted in the autumn, following the virtual extermination of the aphid population by the extremely high summer temperatures, the virus is generally of little economic importance. On the other hand, in the Salinas Valley and other cool coastal areas of the State, where lettuce is produced for the spring, summer, and autumn harvests, the spring crop often suffers heavy damage since its development mostly coincides with the peak period of aphid activity. Soon after thinning incidence of infection often reaches 30 per cent. or more, and by the time the heads mature nearly all the plants may be involved. The summer crop is not appreciably affected, but a renewal of aphid movement during September frequently leads to heavy losses in the autumn [cf. ibid., 31, p. 5].

QUANTZ (L.). **Die Mosaikkrankheit des Salats, eine samenübertragbare Virose.** [Lettuce mosaic disease, a seed-transmissible virosis.]—*Saatgut-Wirtsch., 1952*, 12, p. 279, 1 fig., 1952.

Essential information is presented on the symptomatology, transmissibility by aphids and seed [*R.A.M.*, 31, p. 314], pathogenicity to other hosts, economic importance, and control of lettuce mosaic virus [see preceding abstract], the agent of considerable damage to the crop in Germany [ibid., 32, p. 230]. It is communicable to certain common weeds, such as *Senecio vulgaris* [ibid., 30, p. 20] and (?) *Sonchus asper*, as well as to peas and sweet peas [ibid., 30, pp. 20, 417]. Control should be based on the exclusive use of healthy seed, spraying with insecticides in the greenhouse and, if necessary, in the field, eradication of weeds, and ploughing under of infected refuse. Isolated areas should be set apart for seed production.

LAST (F. T.). **The use of tetra- and penta-chloronitrobenzenes in the control of Botrytis disease and Rhizoctonia attack of Lettuce.**—*Ann. appl. Biol.*, 39, 4, pp. 557–568, 1 diag., 1952.

Experiments on the control of the spring lettuce diseases caused by *Botrytis cinerea* and *Rhizoctonia* [*Corticium*] *solani* [cf. *R.A.M.*, 28, p. 109; 31, p. 270] carried out at Slough and Harlington in the Thames Valley during the mild winters of 1948–9 and 1949–50 are described. Trocadero Improved seed was broadcast in autumn in cold frames at the rate of 2 gm. per 12½ sq. ft., and the seedlings were transplanted into open ground early in spring. To control *B. cinerea* talc dusts containing 5, 10, or 20 per cent. of tetra- or penta-chloronitrobenzene (TC or PC) were applied to the foliage of the seedlings in the frames three to six times by means of a specially constructed apparatus into which air was hand-pumped at 7·5 lb. per sq. in. After each application (9 gm.) the frames remained closed until

the following day. All six dusts controlled *B. cinerea* and equally increased final stand in the frames and in the field, but with increasing concentrations of both compounds the number of seedlings with stem lesions decreased. At similar concentrations TC was more effective than PC. The 5 per cent. TC dust was as effective as 20 per cent. PC.

The dusts injured the leaves, stunted the seedlings, and delayed hearting, TC being more harmful than PC at similar concentrations; 5 per cent. TC was less injurious than 20 per cent. PC.

Spread of *C. solani* was reduced by incorporating the dusts into soil known to be heavily contaminated with the fungus, and in this respect also 5 per cent. TC was as effective as 20 per cent. PC. At a rate of 12·5 gm. dust per 20 kg. soil no dust retarded emergence, but 20 per cent. TC reduced the stand. Foliage applications of 5 per cent. TC and 20 per cent. PC controlled spread of *C. solani*.

It is concluded that both 5 and 10 per cent. TC are preferable to 20 per cent. PC for the control of *B. cinerea*. Dusting with 10 per cent. TC predisposed the lettuces to frost injury though 5 per cent. did not have this effect. For use against *C. solani* 20 per cent. PC is safe.

Pettinari (Carla). **Stemphylium botryosum Wallr. su foglie di Lattuga.** [*Stemphylium botryosum* Wallr. on Lettuce leaves.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 9 (*1951*), pp. 31–40, 5 figs., 1953. [English summary.]

This account of *Pleospora herbarum* isolated from lettuce leaves in Italy has already been noticed from another source [*R.A.M.*, 31, p. 164].

Singh (B.) & Singh (K.). **Fruit rot of Cucurbits.**—*Sci. & Cult.*, 18, 10, pp. 489–491, 3 figs., 1953.

Most of this information on cucurbit fruit rot (*Pythium aphanidermatum*) has already been noticed from another source [see above, p. 466]. Among the hosts observed at the Government Agricultural College Farm, Kanpur, in 1951 and 1952 and confirmed by cross inoculation were *Luffa acutangula*, *Trichosanthes anguina*, cucumber, and *Momordica charantia*. Plants treated with Bordeaux mixture (4–4–50) or Cheshunt mixture (1 oz. per gal.) were significantly better than the untreated. The use of thatches 2 ft. high prevented any loss of crop.

McKeen (C. D.). **Observations on the occurrence and control of grey mould on greenhouse Cucumbers.**—*Sci. Agric.*, 32, 12, pp. 670–676, 1 pl., 1952.

In view of the recent prevalence of cucumber grey mould (*Botrytis cinerea*) [*R.A.M.*, 17, p. 566] in greenhouse crops in south-western Ontario, experiments for effective control were carried out at the Laboratory of Plant Pathology, Harrow, from 1948 to 1951, inclusive. Fermate sprays (2 lb. per 100 gals.) at the susceptible stage reduced substantially the percentage of infection; covering stem lesions with thin ferbam paste gave effective control. Neither treatment was injurious to the cucumber crop.

Stoller (B. B.). **A theory of composting based on the inverse yield-nitrogen law.**—*M.G.A. Bull., 1953*, 42, pp. 180–193, 1953.

This is a discussion of the principles and technique of composting in mushroom cultivation [cf. *R.A.M.*, 32, p. 300], with special reference to the carbon-nitrogen ratio and its effect on yield.

Suminoe (K.) & Nakajima (E.). **The fungi which spoil the seed culture of Cortinellus edodes.**—*J. agric. chem. Soc. Japan*, 25, 1, pp. 26–27, 1951. [Japanese. Abs. in *Biol. Abstr.*, 27, 3, p. 731, 1952.]

The 'seed' culture of the Japanese edible mushroom *Cortinellus edodes* [cf.

R.A.M., 30, p. 96] is frequently infected by *Trichoderma lignorum* [*T. viride*], of which two strains were observed.

CICCARONE (A.). **La 'nebbia' del Carciofo (Cynara scolymus L.) e del Cardo (Cynara cardunculus L.).** [Powdery mildew of Globe Artichoke (*Cynara scolymus* L.) and Cardoon (*Cynara cardunculus* L.)]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 9 (*1951*), pp. 163–204, 12 figs., 1 graph, 2 maps, 1953. [English summary.]

A study of the morphology of the organism causing powdery mildew of globe artichoke (*Cynara scolymus*) and cardoon (*C. cardunculus*) in Italy [*R.A.M.*, 32, p. 423], hitherto referred to *Oidium cynarae* [cf. ibid., 29, p. 493], revealed significant differences in the length to breadth ratio of 50 conidia of ten populations of the fungus from various Mediterranean localities. There is also marked diversity in the symptoms and damage incurred according to environmental conditions and the age of the host. The disease is particularly serious on globe artichokes near Coldirodi, Liguria, at 200 m. above sea level during October to December [loc. cit.]. Artichokes become highly susceptible when they reach the heading stage, but in late autumn only forced plants head. In Italy the fungus appears to survive the winter and summer by means of the vegetative organs, but in Sicily, where the weather is warmer and drier, the ascigerous state (*Leveillula taurica* f. *cynarae*) is known. Varieties with almost divided leaves are particularly susceptible but generally escape infection as they are late-maturing.

Suggested control measures include avoiding growing artichoke or cardoon where primary foci of autumn infections are established, delaying forcing as long as possible, and removing the green parts at soil level during the summer resting period.

Reasons are given for considering *Oidiopsis* a synonym of *Ovulariopsis*. As the conidial state of the artichoke fungus agrees morphologically with *Ovulariopsis* it is renamed *O. cynarae* n.comb. with an emended diagnosis.

WIEHE (P. O.) & DOWSON (W. J.). **A bacterial disease of Cassava (Manihot utilissima) in Nyasaland.**—*Emp. J. exp. Agric.*, 21, 82, pp. 141–143, 1 pl., 1953.

A severe bacterial leaf spot disease of cassava [cf. *R.A.M.*, 28, p. 325], observed for the first time in Nyasaland in April, 1949, was found to be particularly common in the southern province where it causes serious damage in the rainy season (December to April). Marked varietal susceptibility and resistance were observed in the field. The disease is characterized by circular, yellowish leaf spots, 2 mm. in diameter at first, becoming larger, angular, translucent, and surrounded by a broad yellow halo. The centres turn brown and the veins dark brown. From the lower surface of infected leaves issues a profuse exudate resembling yellowish, glistening scales when dry. Under very humid conditions the spots coalesce, destroying large areas of the lamina, sometimes resulting in severe defoliation. Such plants are more subject to attacks by *Botryosphaeria ribis* [ibid., 22, p. 113; 32, p. 91].

Infection experiments have shown that *Xanthomonas cassava* n.sp. is responsible for the disease. It enters the plant through wounds and the stomata. Cultures on nutrient (meat-infusion with yeast-extract) and glucose agars are pale yellow and shiny, being copious on the latter medium and on sterilized potato where a characteristic, pale yellow, confluent, honey-like growth develops, eventually consuming the potato without discoloration. The organism forms much acid from sucrose but less from dextrose and maltose and none from lactose when they are incorporated in a peptone-free medium containing bromthymol blue as indicator and incubated at 27° C. for 28 days. Much hydrogen sulphide is produced in seven days, but little nitrite from nitrate.

The disease is probably the same as that reported from Uganda [ibid., 17, p. 296]

but the bacterium identified as *Bacterium cassavae* is considered to be the same as *B. lathyri* and only saprophytic. *X. cassava* is quite distinct from *X. manihotis* [ibid., 28, p. 513] which appears to be untypical of the genus.

CAIRASCHI (E. A.). **Quelques observations sur l'état sanitaire du vignoble américain. Importance de la maladie de Pierce et autres maladies à virus.** [Some observations on the state of health of American vineyards. The importance of Pierce's disease and other virus diseases.]—*Progr. agric. vitic.*, 138, 31, pp. 59–63, 1952.

Brief notes are given on Pierce's disease [lucerne dwarf virus: *R.A.M.*, 31, p. 168; 32, p. 469] and other virus diseases of vine in North America based on a visit paid to Mexico and southern California in 1951.

GAGNOTTO (ANNA-V.). **La Vite come nuovo ospite di Sclerotium bataticolum Taub.** [The Vine as a new host of *Sclerotium bataticola* Taub.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 9 (*1951*), pp. 17–18, 1 pl., 1953. [English summary.]

This information concerning *Macrophomina phaseoli* on vines in Italy has already been noticed from another source [*R.A.M.*, 31, p. 167].

SPRAGUE (R.). **Field rots of Grapes in north-central Washington.**—*Northw. Sci.*, 27, 1, pp. 1–16, 4 graphs, 1953.

Penicillium expansum predominated among the isolates on potato dextrose agar from samples of grapes (mostly of the Concord variety, with a few European types) collected in north-central Washington in 1950 and 1951. In the former year 178 of the total of 378 isolates were referred to this species and in the latter 841 out of 2,132. Next in order of frequency came *Botrytis cinerea* (98 in 1950 and 783 in 1951), while other species represented were *Alternaria tenuis*, *Aspergillus niger*, *Cladosporium herbarum*, *Corticium centrifugum*, *Fusarium acuminatum* and other *F.* spp., *Pleospora mali* [*P. herbarum*: Mason, *Mycol. Pap., C.M.I.*, 2, p. 24, 1928], *Rhizopus nigricans* [*R. stolonifer*], and *Trichothecium roseum*. A number of the moulds are newly reported on grapes in the State, while some, such as *Penicillium rolfsii* and *P. variabile*, have not hitherto been recorded locally on any fruit. *P. rolfsii*, an uncommon species, described by Raper and Thom [*R.A.M.*, 29, p. 122] on pineapple from Florida, is characterized by the production in culture of masses of bright pink sclerotia, 100 to 300 μ in diameter, superficially resembling pionnotes. *P. expansum* caused moderate to rapid decay of both grapes and apples [ibid., 26, p. 455] in inoculation experiments at 68° to 75° F., while the course of infection by *B. cinerea* [ibid., 31, p. 167] at 30° to 40° was slow to moderate.

In general, well-developed, carefully handled grapes without insect injuries will be free from serious field rots during most years in north-central Washington, where the intense summer heat favours a high sugar content, thereby discouraging mould growth.

BODE (O.) & KÖHLER (E.). **Elektronenmikroskopische Untersuchungen am Kartoffel-X- und Tabakmosaikvirus.** [Electron-microscope studies on Potato X and Tobacco mosaic viruses.]—*Z. Naturf.*, 7b, 11, pp. 598–600, 3 figs., 1952.

The great majority of the tobacco mosaic and potato X-virus particles studied at the Virus Research Station, Celle, Hanover, by J. Johnson's method [*R.A.M.*, 31, p. 397] were of uniform lengths, which may presumably be taken as normal. Tobacco mosaic virus particles measured 280 to 300m μ [ibid., 31, p. 212]; those of X^N (strain M 23) and X^E (Cs35/50) [ibid., 31, p. 202] were 600 to 620 and 560 to 580m μ, respectively.

BAWDEN (F. C.) & PIRIE (N. W.). **Physiology of virus diseases.**—*Annu. Rev. Pl. Physiol.*, 3, pp. 171–188, 1952.

In this review of the physiology of virus diseases the authors deal in particular with the changes in host metabolism influencing virus infections. A bibliography of 108 titles is appended.

KASSANIS (B.). **Some effects of high temperature on the susceptibility of plants to infection with viruses.**—*Ann. appl. Biol.*, 39, 3, pp. 358–369, 1 pl., 1952.

In studies at Rothamsted Experimental Station, Harpenden, Herts., it was found that when plants were kept at 36° C. for some time before inoculation there was an increase in susceptibility to infection by tomato bushy stunt and tobacco mosaic viruses in *Nicotiana glutinosa* and the latter virus in bean (*Phaseolus vulgaris*) var. Riscardo milho, the Rothamsted strain of tobacco necrosis virus and a severe strain of cucumber mosaic virus in Prince bean, and the former virus and tomato spotted wilt in White Burley tobacco. When the plants were kept at 36° after inoculation fewer local lesions developed than at lower temperatures (usually between 18° and 23°), but the effects differed with the different viruses. Tomato spotted wilt and tobacco mosaic viruses, both of which could induce some lesion formation under these conditions, can multiply at 36° [cf. *R.A.M.*, 32, p. 170] and have large thermal coefficients of heat inactivation. With tobacco necrosis, tomato bushy stunt, and cucumber mosaic viruses, post-inoculation exposure to 36° for a day or more completely prevented lesion formation. These three viruses do not appear to multiply in plants at 36°, and though they have high thermal inactivation points their temperature coefficients of thermal inactivation are small.

The degree to which lesion formation was affected by pre- or post-inoculation treatment depended on the time of exposure and the physiological condition of the plants.

When infected plants were kept at 36° the symptoms changed considerably. *N. glutinosa* inoculated with tobacco mosaic virus developed chlorotic instead of necrotic local lesions, and became systemically infected. On return to ordinary glasshouse conditions the lesions became necrotic and systemically infected plants wilted and died.

STOREY (H. H.). **Research on virus diseases of plants.**—African Regional Scientific Conference, Johannesburg, October 17 to October 28, 1949. II. Statements and Communications, pp. 168–170, 1949–50. [French summary. Received 1953.]

The need to expand research on plant virus diseases in Africa [cf. *R.A.M.*, 31, p. 421] still exists, in spite of recent advances. Important losses in both short-term and permanent crops in Africa are caused by viruses. The best prospect of advance in control would appear to lie in breeding for resistance [cf. ibid., 32, p. 63] and the study of epidemiology, particularly insect vectors.

Plant quarantine announcements.—*F.A.O. Plant Prot. Bull.*, 1, 2, pp. 30–32, 1952.

Plant quarantine regulations controlling the importation of plants and plant materials, issued between February and June, 1952, by the governments of Ecuador, France, Japan, New Zealand, Norway, Sweden, South Africa, and by the United States Trust Territory of the Pacific Islands are briefly summarized.

Plant quarantine announcements.—*F.A.O. Plant Prot. Bull.*, 1, 3, pp. 45–46, 1952.

By the Canadian Order in Council, P.C. 3811 of 21st August, 1952, hop plants from England and Wales are required to be accompanied by a certificate stating

that wilt (*Verticillium albo-atrum*) is not known to be present in the locality where the plants were grown.

Three Orders dated 30th September, 1952, published in the *J. off.* [*A.O.F.*], 84, 242, 1952, restrict the importation of certain plant materials into Guadeloupe, [French] Guiana, and Martinique [*R.A.M.*, 32, p. 365]. Sugar-cane, including cuttings, seedlings, and seeds, must be certified to be free from virus diseases.

By Order, No. 18,055 of 3rd June, 1951, before import into Hungary is permitted potatoes must be certified free from wart (*Synchytrium endobioticum*) and scab (*Spongospora subterranea*), cotton from leaf spot (*Xanthomonas malvacearum*), flax from anthracnose (*Colletotrichum linicola*) and pasmo (*Mycosphaerella* [*Sphaerella*] *linorum*), onions and onion seed from smut (*Urocystis cepulae*), peas, beans [*Phaseolus vulgaris*], and other legumes (seed and green plants) from halo blight (*Pseudomonas phaseolicola*), common bean blight (*X. phaseoli*), and bean wilt (*Corynebacterium flaccumfaciens*), vegetables and ornamentals from yellow disease of hyacinth (*X. hyacinthi*), lemon and orange fruits and seedlings from canker (*X. citri*), and fruit tree seedlings from virus diseases and crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*). Fruit tree seedlings must be certified cyanide-fumigated.

Plant quarantine import restrictions.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 179, pp. 134–152, 1951. [Received April, 1953.]

Summaries are given of the plant quarantine import restrictions operating in Bermuda, Brazil, Canada, Costa Rica, France [see preceding page], the French Zone of Morocco, and Holland [cf. *R.A.M.*, 32, p. 172].

Nursery stock, plant and seed quarantine No. 37. Revision of quarantine and regulalations effective December 5, 1950.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 179, pp. 114–129, 1951. [Received April, 1953.]

A list is given of the nursery stock and other plants and plant products the importation of which from foreign countries into the United States (except by the Department of Agriculture for experimental or scientific purposes) is prohibited as from 5th December, 1950, in order to prevent the introduction of certain diseases and pests new to or not widely distributed in the country [cf. *R.A.M.*, 29, p. 112].

Pflanzenschutz-Tagung der Biologischen Bundesanstalt Braunschweig in Würzburg, 23.–25.Oktober 1951. [Plant protection session of the Federal Biological Institute, Brunswick, at Würzburg, 23rd to 25th October, 1951.]—*Mitt. biol. ZentAnst. Berl.* 74, 168 pp., 13 figs., 18 graphs, 1952.

The following are among the papers presented at the above-mentioned conference [cf. *R.A.M.*, 31, p. 533]. J. Hus (pp. 6–11) describes the organization of the spray warning service in Holland and its application to the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*: ibid., 31, p. 477]. In 1951 *V. inaequalis* discharged its ascospores in profusion from 5th to 17th and 28th to 30th April and from 7th to 9th, 14th to 15th, and on 21st May, the corresponding dates for *V. pirina* being 2nd to 15th and 28th to 30th April and 5th to 9th, 14th to 15th, 21st, and 23rd May.

Frl. H. Köhler (pp. 15–18) reports the results of preliminary experiments at the Aschersleben branch of the Biological Institute on the isolation of antibiotic-producing soil fungi, with special reference to seasonal variations in their occurrence [cf. ibid., 7, p. 740]. Among the actinomycetes obtained in pure culture on soil-extract-peptone and asparagine-glucose agars, 42·8 per cent. secreted antibiotic substances, the corresponding figures for the *Penicillium* and *Aspergillus* spp. being 8 and 9 per cent., respectively. The actinomycetes comprise 56 strains which inhibited all the organisms tested, namely, *Fusarium culmorum*, *Alternaria tenuis*, *Helminthosporium papaveris* [*Pleospora calvescens* or *P. papaveracea*: ibid., 32, p.

99], *Rhizoctonia* [*Corticium*] *solani*, *Corynebacterium michiganense*, and *Pseudomonas medicaginis*. The actinomycete population in the upper soil layers (down to 30 cm.) increased from the beginning of January to mid-March and in the lower ones (to a depth of 50 cm.) to early May, after which a decline ensued, so that the climax is evidently reached before the main growing period of many important crops. An intensive blue, red, or purple pigmentation [cf. ibid., 26, p. 509] characterized a fair number of the actinomycetes isolated up to mid-April and again from mid-September onwards, in contrast to the colourless or yellow to brown strains collected in the middle of the year [cf. below, p. 590].

Promising results were obtained by M. Klinkowski (pp. 19–22), in collaboration with Frl. H. Köhler, in the antibiotic seed treatment of bean (*Phaseolus vulgaris*) for the control of grease spot (*Pseudomonas medicaginis* [f. sp. *phaseolicola*: ibid., 21, p. 512]), which has been causing steadily increasing losses of late years in central Germany. Seed from diseased plants of 22 varieties was segregated into (1) recognizably infected and (2) externally healthy, both being immersed for varying periods in culture filtrates of *Penicillium chrysogenum* or *Streptomyces griseus*. In lot (1) soaking for $\frac{1}{2}$, 1, or 2 hours in penicillin resulted, respectively, in 50, 59, and 59 per cent. healthy and 18, 0, and 1 per cent. diseased plants, while the corresponding figures for streptomycin were 61, 64, and 64 per cent., and 7, 1, and 0 per cent., the remaining seedlings failing to emerge. The untreated seeds produced 13 per cent. healthy and 24 per cent. diseased plants. Of those that emerged in lot (2) the corresponding periods in penicillin produced 78, 85, and 86 per cent. healthy plants and in streptomycin 83, 84, and 90·5 per cent., respectively, the percentages of diseased being 11, 1, and 0, and 6, 0, and 0·5 per cent., respectively, whereas the untreated included 41 per cent. healthy and 38 per cent. diseased. Two hours' immersion of a total of 6,300 seeds of 21 varieties in penicillin and streptomycin raised the percentages of healthy stands in the field from 46 (untreated) to 87 and 92, respectively, and reduced the incidence of infection from 35 to 0·2 and 0·1 per cent., respectively. Non-emergence percentages in the three lots were 19, 12·8, and 7·9, respectively.

In Hannelore Müller's *in vitro* experiments (pp. 23–27) at the Stuttgart-Hohenheim Plant Protection Institute, the *Fusarium* sp. of the *Elegans* group responsible for cucumber wilt [ibid., 31, p. 314] was the least sensitive of the pathogens tested to the influence of calcium cyanamide in concentrations corresponding to soil amendments of 1·5, 3, and 6 kg. per cu. m., and *Pythium debaryanum* and *Ophiobolus graminis* were the most, *Corticium solani* being intermediate in its reaction. Three non-pathogenic soil fungi were similarly treated, of which *Aspergillus niger* and *Penicillium* sp. proved highly resistant, while the growth of *Mucor* sp. was much more readily inhibited.

E. L. Loewel (pp. 68–72) reports from Jork, Schleswig-Holstein, that the substitution of mercurials for copper in pre-blossom sprays against apple scab [ibid., 32, p. 195] proved less successful in 1951 than in 1950 [ibid., 31, p. 534]. Pear scab [ibid., 32, p. 196], however, was effectively combated by mercurials. Wettable sulphurs, even with the addition of copper at high concentration, proved inferior to 2 per cent. Bordeaux mixture for pre-blossom sprays on susceptible apple varieties. There were considerable variations in the efficacy of different brands of wettable sulphur, the best results being obtained with those composed of small particles [cf. ibid., 29, p. 107 *et passim*] and forming heavy, tenacious deposits. On the other hand, apple mildew [*Podosphaera leucotricha*: ibid., 30, p. 276] was best controlled by less tenacious preparations with larger, coarser crystals [cf. ibid., 32, p. 260]. For post-blossom anti-scab treatments the wettable sulphurs, especially with the addition of lead arsenate, proved superior to lime-sulphur but inferior to fuclasin, nirit, and pomasol. The damp summer was propitious for further trials with the three last-named fungicides [ibid., 31, p. 534], of which nirit was the most

generally efficient. In contrast to the stimulus to leaf growth conferred by fuclasin, pomasol caused an abrupt cessation with a consequent favourable effect on fruit coloration. The combination of lead arsenate with pomasol again resulted in severe leaf scorch, as also did the admixture of oily adjuvants with the fungicides, especially nirit.

H. Hochapfel (pp. 77–81) discusses the intractable problem of apple mildew control in relation to the increasing prevalence of the disease in south-west Germany since 1948. In 1951 spraying experiments with wettable sulphur at 0·5 to 1·5 per cent. were performed at the Heidelberg Horticultural Institute on six varieties, of which Allington Pippin, Golden Pearmain, and Klar received three pre- and three post-blossom applications, while Cox's Orange, Nordhausen, and Signe Tillisch were given only one pre- and three post-blossom treatments. The results were similar to those obtained in Switzerland [ibid., 28, p. 525; 31, p. 495, *et passim*]. There was no clear-cut difference between the three brands of wettable sulphur of varying particle size. The average reductions in the incidence of infection on the three varieties receiving only one pre-blossom spray were 48 and 67 per cent. for the lower and higher concentrations, respectively. Where the full schedule was given, however, the mildew reductions on Klar, Allington Pippin, and Golden Pearmain were 88, 80, and 54 per cent., respectively.

Experiments in the control of *Ustilago decipiens* [*U. avenae*] on *Arrhenatherum elatius* [ibid., 27, p. 125] are reported by F. Hinke (pp. 139–141) from the Bavarian Agricultural Institute, Munich, where abavit-neu 40/41, ceresan UT 1875 a, ceresan UT 4268, and fusariol 3140 b were applied as dusts at 500 and 1,000 gm. per 100 kg. seed while abavit 3330 a, ceresan U564, formalin, and fusariol 3456 were used as solutions at 0·2 and 0·3 per cent. for immersion *in vacuo*, the first two for 30 and the two others for 15 minutes. In the dust series the incidence of infection was reduced from 18·4 to under 1 per cent. by all the treatments except fusariol at 500 gm., which allowed the development of 1·3 per cent. The vacuum immersion method resulted in the complete elimination of the smut, except for 0·1 per cent. in the lot treated with fusariol at 0·2 per cent.

P. Mühlethaler, E. Günthart, and H. Höhener (pp. 142–145) present a report from the firm of R. Maag A.-G., Dielsdorf, Zürich, on the modes of application and results achieved in the use of motor sprayers, mist blowers, and helicopter aeroplanes for the large-scale treatment, e.g., of potato blight (*Phytophthora* [*infestans*: cf. ibid., 32, p. 275]) and beet leaf spot (*Cercospora* [*beticola*]) in Switzerland. Cupromaag and virikupfer [viricuivre: ibid., 26, p. 351], which are applicable, respectively, at 8 to 10 and 16 to 20 times the prescribed strength, were used in all the experiments in 1951. Some of the automatically guided motor sprayers used in the potato blight trials were fitted with special nozzles, 0·9 or 0·7 mm. in diameter, for the fine distribution of small quantities of spray mixture, thereby achieving an hourly coverage of 60 and 79 are [1 are = 119·6 sq. yds.], respectively, for a spray consumption of 680 and 450 l. per ha., respectively, the corresponding figures for a horse-drawn machine with the standard 1 mm. nozzles being 35 are and 1,300 l., respectively. The American aero-mist sprayer L80 (Lawrence Aero-Mist Sprayer Company, Greenfield) covered 63 are of potatoes for a spray consumption of 450 l. per ha., the corresponding figures for the helicopter being 710 and 75, respectively. The extent of the beet fields covered by the mist blower was 92 are and the spray consumption 115 l. per ha., while the corresponding figures for the helicopter were 1,150 and 88, respectively.

Reports of Prairie Regional Laboratory, Saskatoon. Reports of Prairie Regional Committee.—*Nat. Res. Coun. Rev., 1951*, pp. 37–39, 216, 221–223, 1952.

From the Division of Microbiology and Fermentation Chemistry A. C. Neish, A. C. Blackwood, R. H. Haskins, J. A. Thorn, Mrs. W. M. Dion, and J. W.

Spyers report that in *in vitro* tests with 335 antibiotic-forming bacteria 20 were active against *Ustilago tritici* and *U. nuda* [*R.A.M.*, 31, p. 485]. About 40 *Ustilago* strains were tested for antibiotic activity and production of ustilagic acid [ibid., 31, p. 448]. None of the new strains secured by irradiation was a better acid producer than the original isolate. Alkaline hydrolysis completely destroyed the activity of the acid. Of some 40 fungi selected for use as starch saccharifying agents for *Bacillus subtilis* fermentations a strain of *Gliocladium roseum* [cf. ibid., 27, p. 487] was the best.

In investigations at the University of Manitoba under S. B. Helgason a 2-acre plot of Grimm lucerne inoculated with plant debris infested with *Ascochyta imperfecta* [cf. ibid., 31, p. 52] was treated with 95 per cent. wettable sulphur, 7 per cent. active trox (tribasic copper sulphate), or 10 per cent. active fermate. There was a significantly higher seed yield from the fermate plots, which had a much lower insect infestation than the others. Even in the extremely severe epidemic of 1950 individual plants remained almost unaffected. Preliminary tests indicated wide variation in susceptibility resulting from artificial inoculation.

In work under P. J. Olson at the University of Manitoba on the inheritance in barley of resistance to leaf rust (*Puccinia anomala*) [*P. hordei*: cf. ibid., 26, p. 448; 30, p. 507] four parental varieties differing in resistance and morphological characters were chosen for intercrossing in all combinations. The parental lines were exposed to an epiphytotic of a mixture of races in 1949, and the degree of infection was determined. The leaf-rust reaction of the F_1, F_2, and F_3 lines is being determined in the greenhouse and much evidence has been obtained that seedling reaction to the disease corresponds to adult plant reaction.

In field tests by A. W. Henry at the University of Alberta on the control of cereal covered smuts by seed treatment with antibiotics [ibid., 30, pp. 407, 408; 31, p. 428] actidione (10 p.p.m.), while significantly reducing covered smut of barley [*U. hordei*], gave less satisfactory control than ceresan M and panogen 8 [see below, p. 549]. Though not suitable for immediate use in smut control, it would appear to merit further study. Subtilin (1,000 p.p.m.) gave no appreciable control of the smuts, and the same was true of filtrates of broth cultures of *B. subtilis* (A 32) with and without the bacteria. Broth cultures or a bacterial suspension added to hot-water-treated Red Bobs wheat in a field test gave a significant increase in emergence, similar to treatment with ceresan M. Broth filtrates gave much less protection. *B. subtilis* (A 32) was unaffected by actidione in laboratory tests, and the two antibiotics could be combined for a wider range of control. Actidione compared favourably with ceresan M, panogen 8, and formaldehyde in the control of oat covered smut [*U. kolleri*] by seed treatment.

W. Leach reports that in research at the University of Manitoba in no case was it possible to reproduce grey speck disease of oats [ibid., 32, p. 124], even in plants grown entirely without manganese. Experiments with bush beans (*Phaseolus vulgaris*), which showed iron and manganese deficiency symptoms most clearly, indicated that these symptoms were produced not as a result of the actual amounts of iron and manganese supplied to the plants (except when the concentration of these elements was extremely low), but when the iron to manganese ratio lay outside an optimum range (for bean between 2 and 4). Analyses of the plants indicated no direct relationship between the concentrations of iron and manganese in the culture solutions and the amounts of these elements absorbed by the plants.

Conners (I. L.) & Savile (D. B. O.). **Thirty-first Annual Report of the Canadian Plant Disease Survey, 1951.**—xix+122 pp., 1952. [Mimeoprinted.]

In the section of this report [cf. *R.A.M.*, 32, p. 62] dealing with new or noteworthy diseases (pp. ii–v) [given also in French] it is stated that in 1951 cereal stem rust (*Puccinia graminis*) [ibid., 32, p. 471] reached the Prairie Provinces too late

to cause damage. The predominant race in Manitoba was 15B, with some development of race 56 [cf. ibid., 30, p. 314; 31, p. 486] in southern Alberta. Evidence was obtained at Winnipeg of the virus nature of barley false stripe, which has been known in Manitoba since 1924 or earlier and has been recorded in several provinces of Canada [cf. ibid., 30, pp. 24, 408]. *Helminthosporium turcicum* was epidemic for the first time on maize in south-western Ontario.

New records were root necrosis (*Gloeosporium bolleyi*) [cf. ibid., 27, p. 366] of oats at Ottawa, leaf spot (*Selenophoma donacis* var. *stomaticola*) [cf. ibid., 28, p. 329] on *Avena fatua* in Saskatchewan, *Tilletia pallida* [cf. ibid., 31, p. 331] in a seed sample of *Agrostis canina* from Prince Edward Island, and anthracnose (*Colletotrichum viciae*) [cf. ibid., 8, p. 66] on hairy vetch [*Vicia villosa*: see below, p. 564] at Kentville, Nova Scotia.

Weather conditions were highly favourable for the development of potato blight (*Phytophthora infestans*) [ibid., 31, pp. 52, 77, 226] in most parts of Canada except British Columbia, and heavy losses were sustained in the Maritime Provinces and parts of Quebec. In Montreal unsprayed fields were a total loss. Where the crops were protected by spraying harvests were excellent. During the past seven years the average marketable yields from plots sprayed with Bordeaux mixture at Charlottetown, Prince Edward Island, have been 40 per cent. greater than those of unsprayed plots. Small amounts of blight were present on the foliage of the previously immune Canso and Keswick [cf. ibid., 31, p. 53] and also on Kennebec [ibid., 32, p. 208] while tuber rot was caused at several places in Quebec and the Maritimes. Experimental evidence was obtained that there is a race of *P. infestans* able to infect Green Mountain, Canso, and Keswick. The mauve-blossom strain of Sebago is the only variety highly resistant to *Synchytrium endobioticum* [ibid., 30, p. 308; 32, p. 63] among those being tested in Newfoundland.

New records of vegetable diseases included rust (*Uromyces appendiculatus*) on Lima bean [*Phaseolus lunatus*] at Wainfleet, Ontario; brown spot (*Cephalosporium apii*) on green Pascal celery near Burlington, Ontario; and *Aphanomyces cladogamus* on [chilli] pepper [ibid., 32, p. 360] at Harrow, Ontario. Tomato rot (*Colletotrichum atramentarium*) [C.M.I. map No. 190] was found in a greenhouse near Leamington, Ontario. Yellows (*Fusarium oxysporum* f. *conglutinans*) [*F. conglutinans*] was severe on cabbage in Montreal, though not previously observed in this region. The finding of rust (*Puccinia coronata*) on *Rhamnus utilis* [cf. *R.A.M.*, 28, p. 390; 31, p. 430] added a new host for North America.

Report of the Division of Mycology and Plant Pathology.—*Sci. Rep. agric. Res. Inst. N. Delhi, 1949–1950*, pp. 81–88, 1952. [Received March, 1953.]

The following are among the items of information presented in this report [cf. *R.A.M.*, 31, p. 538; 32, p. 237]. In six plantings of oats sown from 18th October to 28th December, 1949, the maximum incidence (45 per cent.) of leaf spot (*Helminthosporium* [*Pyrenophora*] *avenae*) occurred in those of 19th and 30th November, while the amount developing in the earliest-sown plots was negligible.

The results of experiments on the mode of transmission of long smut of jowar [sorghum], caused by *Tolyposporium ehrenbergii* [ibid., 32, p. 493], proved conclusively that the disease is air-borne. Of 64 ears inoculated with a chlamydospore suspension of the smut, 33 developed typical infection, while 61 serving as controls remained healthy, the number of sori produced in individual ears ranging from one to 12.

Confirmation that *T. penicillariae*, the agent of bajra [*Pennisetum typhoides*] smut [ibid., 30, p. 510], is air-borne was obtained in further experiments on its mode of transmission. The occurrence of secondary infection was also demonstrated, fresh spores collected from an early-sown crop severely attacking ears inoculated with them while still enclosed in the leaf sheaths.

During the period under review 76 parent sugar-cane varieties, including *Saccharum spontaneum* and other *S.* spp., were tested for their reactions to red rot (*Colletotrichum falcatum*) [*Physalospora tucumanensis*: ibid., 32, p. 472]. The 20 which showed high resistance had given more or less comparable results for five years or longer. Eight varieties [unspecified] further proved resistant to nodal infection, the chief mode of invasion in nature [ibid., 31, pp. 87, 539]. Sugar-cane smut (*Ustilago scitaminea*) reduced the yields of Co. 312 and Co. 313 by 29·3 and 23·1 per cent., respectively. In tests comprising 53 parent varieties at Karnal and 56 at Delhi, 22 were highly resistant and had also withstood the disease in previous trials for five years or more.

Of the various fungi concerned in the etiology of gram [*Cicer arietinum*] wilt, *Fusarium orthoceras* [var. *ciceri*: ibid., 30, pp. 405, 601] induced typical wilt symptoms in inoculation experiments and *Operculella padwickii* [ibid., 28, p. 160] closely similar ones, the incidence of infection in both cases ranging from 53 to 83 per cent. The other species isolated from diseased plants, i.e., *Neocosmospora*, *Rhizoctonia* [*Corticium*] *solani*, *R. bataticola* [*Macrophomina phaseoli*], and *Sclerotium rolfsii* caused different symptoms, the percentage of infection ranging from 5 to 39.

Of 127 cultures of linseed flax hybrids inoculated for the first time with a mixture of four Indian physiologic races of *Melampsora lini* [ibid., 32, pp. 79, 188], 107 were immune or resistant in both the seedling and adult stages, ten were semi-resistant in the former phase and developed resistance with advancing maturity, two were susceptible, and the reactions of seven were variable. *F. lini*, isolated from wilted flax plants [ibid., 32, p. 493], is most prevalent during March. In inoculation tests infection reached a maximum at 25° to 28° C. *Macrophomina phaseoli* was also isolated from a few diseased plants. *Alternaria lini*, the agent of a seed-borne leaf blight and collar rot of linseed [ibid., 25, p. 582], was pathogenic to plants inoculated at the flowering stage. In cross-inoculation experiments linseed was attacked by *A. lini* and *A. brassicae* but not by *A. solani* or *A. tenuis*.

Of 20 pigeon pea varieties tested for their response to *F. udum* [ibid., 31, p. 540; 32, pp. 23, 430] in a heavily infested field and in pots containing inoculated soil, five proved to be resistant, namely, N.P.41, D.16–17–2, D.419–2–4, C.38–1–2, and C.38–5. The pathogenicity of the fungus was reduced by the presence in the soil of *Rhizopus nigricans* [*R. stolonifer*] and *Cunninghamella elegans*. Both fungi grew much more rapidly than *F. udum* and prevented its attack on the wheat straw introduced into the medium.

Of ten fungicides tested for their efficacy against covered smut of oats [*U. kolleri*], aagrano [ibid., 31, p. 540] and copper carbonate gave absolute control, while the incidence of infection in the other treated lots ranged from 0·75 (semenon) [ibid., 30, pp. 223, 317] to 6·6, compared with 17·3 in the controls. The application to wheat seed of semenon (4 in 1,000), spergon (10 in 1,000), semenon (2 in 1,000), ceresan (3 in 1,000), agrosan GN (5 in 1,000), and spergon (7 in 1,000) increased germination from 79 to 94, 91, 90, 90, 89, and 89 per cent., respectively. Dressings of spergon, semenon, ceresan, sulphur, and barbak raised the germination of oat seed from 78 to between 96 and 97 per cent., the corresponding figure for agrosan GN being 94. The germination of maize seed treated with agrosan GN reached 99 per cent. as against 84 in the control lot.

Perenox and Burgundy mixture again controlled potato blight [*Phytophthora infestans*] at Kufri [ibid., 32, p. 146], the latter increasing the average yield from 10 to 48 lb. per 100 plants. It was estimated that 95 to 100 per cent. infection of leaf area caused a 60 per cent. reduction of yield, and 25 to 60 per cent. infection a drop of 40 per cent. Early blight [*A. solani*: loc. cit.] caused yield reductions of 46 and 78 per cent., as a result of 50 to 75 and 100 per cent. leaf infection, respectively.

In Agra wheat the drop in yield consequent on 10 to 25, 40 to 50, and over 75 per cent. infection by black rust [*Puccinia graminis*: ibid., 31, p. 540; 32, p. 307] was computed at 11·5, 22·3, and 55·2 per cent., respectively, the corresponding figures for N.P.4 being 3·9, 16·6, and 42·2 per cent. Uredospores of *P. graminis* and *P. triticina* were trapped on vaseline-coated slides on 21st to 23rd January, 1950, and the rusts appeared on the wheat crop on 6th and 10th February, respectively. Uredospores of *P. glumarum* were caught on 22nd to 26th December, and the symptoms were observed on the wheat crop on 16th January.

Of 59 grasses exposed to infection by *P. glumarum* and *P. graminis*, only *Phalaris minor* was attacked by the former species, while the latter occurred on *Bromus mollis*, *B. carinatus*, *B. coloratus*, *Hordeum distichum*, *H. murinum*, *H. stenostachys*, *Agropyron semicostatum*, *Lolium perenne*, *Aegilops squarrosa*, *A. ventricosa*, *A. trinocitis*, and *Helaria jamesii*. *Puccinia glumarum* from *Phalaris minor* did not attack wheat and is probably a different physiologic race, whereas the isolates of *Puccinia graminis* from the above-mentioned grasses were pathogenic to wheat and evidently belong, therefore, to *P.g. tritici* [cf. ibid., 32, p. 192].

A species of *Alternaria* closely resembling *A. longipes* caused severe damage to tobacco [C.M.I. map No. 63] and *Nicotiana rustica* at New Delhi.

The *Crotalaria juncea* mosaic virus [*R.A.M.*, 30, p. 520] operates over a pH range from 1·55 to 9·87. At a dilution of 1 in 10 it is inactivated by treatment with 0·5 per cent. copper sulphate. The results of tests on the transmission of phyllody of *C. juncea* [ibid., 18, p. 181] by grafting, sap inoculation, and through the agency of *Bemisia tabaci* indicated that a mixture of two viruses is concerned, one sap-transmissible and the other, which was shown to be identical with tobacco leaf-curl virus, exclusively by means of *B. tabaci*. Viruliferous white flies fed on *C. juncea* plants infected by the sap-transmissible virus appeared to be capable of inducing the symptoms of phyllody.

The virus responsible for mosaic of *Phaseolus mungo* [ibid., 11, p. 417] lost its infectivity after ten minutes' exposure to a temperature of 60° C. and was inactivated at a dilution of 1 in 2,000, as well as by treatment with 50 per cent. alcohol, 0·5 per cent. copper sulphate or mercuric chloride, and 5 per cent. carbolic acid. It remained infective for 26 hours at 15° to 37°.

Enation mosaic virus of *Hibiscus rosa-sinensis* [ibid., 31, p. 541] was transmitted by grafting to *H. esculentus*, cotton (*Gossypium indicum*, *G. hirsutum*, and Sakel), and *Zinnia elegans*, and by *B. tabaci* to *Z. elegans* and *H. esculentus*.

A graft-transmissible mosaic virus of groundnut [cf. ibid., 18, p. 608] was observed at the Indian Agricultural Research Institute.

Göbelez (M.). **Kuzey Türkiye bitkilerinde 1952 yılında rastlanılan hastalıkar.** [Diseases encountered on plants in north Turkey in 1952.]—*Bit. Kor. Bült.* [*Bull. Plant Prot., Ankara*], *1952*, 4, pp. 23–25, 1952.

During the 1952 survey the following diseases were observed, among others, in north Turkey [cf. *R.A.M.*, 32, p. 279]: *Pseudopeziza medicaginis* on lucerne [C.M.I. map No. 129], *Cycloconium oleaginum* on olive [ibid., No. 183], *Colletotrichum lindemuthianum* on bean (*Phaseolus vulgaris*) [ibid., No. 177], *Septoria lycopersici* on tomato [ibid., No. 108], *Phytophthora infestans* on potato [ibid., No. 109], *Kuehneola fici* on fig [cf. *R.A.M.*, 31, p. 33], and *Piricularia oryzae* on rice [ibid., 27, p. 350; C.M.I. map No. 51].

Plant pathology.—*Rep. N.Y. St. Coll. Agric. Cornell* [combined with *Rep. Cornell agric. Exp. Sta.*] *1950*, pp. 148–158, [? 1951].

In this report [cf. *R.A.M.*, 29, p. 498] it is stated that a histological study by G. C. Kent and W. C. Paddock of the reaction of oat varieties to *Helminthosporium victoriae* [ibid., 32, p. 426] revealed that the fungus penetrates directly into the

epidermal cells of the susceptible Vicland, permeating the leaf intercellularly, and may emerge from the opposite leaf surface to form aerial hyphae or conidiophores in 24 to 48 hours. Chloroplast disintegration, cytoplasm coagulation, and finally cell clearing occur. On inoculated leaves of the resistant varieties Clinton and Cornellian spore germination and germ-tube development were reduced; any hyphae that penetrated the epidermal cells dissolved in 50 to 80 hours leaving a watery, translucent, non-granular area in the cytoplasm. In Cornellian an amber cell wall discoloration and a distinct amber, granular cytoplasmic reaction was observed in 18 to 50 hours. Strains of *H. victoriae* believed to be more virulent did not produce these reactions until about 72 hours after inoculation. Therefore, although oat varieties showing no visible symptoms have been called 'immune' they are really only highly resistant.

A. G. Newhall states that a new celery variety, provisionally designated 45–219 [cf. ibid., 31, p. 543], obtained by back-crossing Danish × Golden Self Blanching to Cornell 19 and again to Cornell 6, was released for trial during 1949–50. It has been grown repeatedly and successfully, without spraying or dusting, under conditions conducive to early blight (*Cercospora apii*) [ibid., 31, p. 362]. It is also moderately resistant to late blight (*Septoria apii*) [loc. cit.]. Seed was increased during 1950.

K. G. Parker, A. B. Burrell, W. D. Mills, and R. M. Adams found that sweet cherries may be sprayed effectively with a fixed-outlet spray duster using a mist spray rather than a spray dust. Large apple trees may also be sprayed effectively by this method provided that adjustments are made in the arrangement of the nozzles and the air pattern. Deposit studies gave some indication that low water pressures are more suitable for early season applications than high ones. It is important to add spreader-stickers to suspensions. The addition of a back-flushing system to the machine eliminated most nozzle clogging, and the use of hardened steel tips reduced wear in liquid nozzles to unimportance.

Extending studies begun in 1948, A. B. Burrell obtained equal control of scab [*Venturia inaequalis*: ibid., 32, p. 386] and insects in five-acre plots in a McIntosh apple orchard sprayed throughout the season with mixtures two, four, or eight times the standard concentration by means of a large air-blast sprayer designed for regular dilute mixtures but modified by special nozzles to produce a rather fine mist. If these sprays continue to give satisfactory control there will probably be a saving of 20 to 25 per cent. in material and cost of application.

Official Virginia varietal tests 1950. Field crop recommendations for 1951.—*Bull. Va agric. Exp. Sta.* 445, 18 pp., 1951. [Received June, 1953.]

The data in this publication are a condensed summary of the official varietal crop tests conducted by the Virginia Agricultural Experiment Station in 1950 and of reports of official varietal tests in past years. The descriptions of the varieties recommended for planting in 1951 include notes on their resistance and susceptibility to various diseases.

De Wilde de Ligny (H. J.). **Outbreaks and new records, July–August, 1952, Netherlands New Guinea.**—*F.A.O. Plant Prot. Bull.*, 1, 2, p. 29, 1952.

In July and August, 1952, tomatoes and groundnuts growing near Manokwari, Dutch New Guinea, were affected by bacterial wilt (*Pseudomonas solanacearum*) [*R.A.M.*, 30, pp. 95, 509, and below, p. 547]. The Schwartz 21 groundnut was resistant. In Japen Island tomatoes and eggplants sustained moderate damage.

Jaarverslag over 1950. [Annual report for 1950.]—*Versl. Dep. Landb. Suriname*, 87 pp., [undated, received June, 1953].

This report on the work of the Department of Agriculture, Surinam [cf. *R.A.M.*,

32, p. 68], comprises the following items of phytopathological interest (pp. 49, 52). The oldest oil palms in the north of the culture garden ('Cultuurtuin') have deteriorated rapidly of late years, while some of the younger ones were severely infected by a disease believed to be identical with the vascular wilt (*Fusarium oxysporum*) reported from West Africa [ibid., 30, p. 156].

Practically all the spoilage of stored citrus fruits over a five-week period was found to be due to stem rot (*Diplodia* [*natalensis*]).

WINSTEAD (N. N.) & KELMAN (A.). **Inoculation techniques for evaluating resistance to Pseudomonas solanacearum.**—*Phytopathology*, 42, 11, pp. 628–634, 4 graphs, 1952.

At the North Carolina State College, inoculation with *Pseudomonas solanacearum* [*R.A.M.*, 30, p. 406], either by puncturing the stem through a drop of bacterial suspension or by pouring the same over injured secondary roots, was equally effective on succulent seedlings of susceptible hosts like Marglobe tomato, Irish Cobbler potato, and Variety 402 tobacco. In resistant selections of tomato (L1, L2, R2, R4, and R5), tobacco (Oxford 26, Dixie Bright 27, 101, and 102), and Schwarz 21 groundnut [see above, p. 546], higher disease indices were obtained by stem than by root inoculations, though the latter proved more helpful in differentiating between resistant and susceptible plants and its efficacy was not significantly impaired by an increase in the number of Marglobe tomato seedlings from 45 to 450 per flat.

In resistant tomato plants susceptibility to bacterial wilt decreased with advancing age from four to eight weeks, but the susceptible Marglobe and Louisiana Pink were as readily attacked at maturity as in the juvenile phase provided conditions favouring rapid, succulent growth were maintained [cf. ibid., 29, p. 338]. No reduction of disease severity in four-week-old Marglobe seedlings followed a decrease in the inoculum concentration by successive dilutions to 1 in 128, but in the resistant L1 the weaker suspensions produced lower disease readings.

P. solanacearum was isolated from resistant tomato, tobacco, and groundnut plants showing no external symptoms of wilt.

LINK (G. K. K.), WILCOX (HAZEL W.), EGGERS (VIRGINIA), & KLEIN (R. M.). **Role of nitrate-nitrogen nutrition in growth of Tomato and crown gall.**—*Amer. J. Bot.*, 40, 6, pp. 436–444, 5 figs., 1953.

In work at the Department of Botany, University of Chicago, Illinois, Bonny Best tomato plants were grown at two different levels of nitrate-nitrogen nutrition. Rooted cuttings were inoculated with crown gall bacteria (*Agrobacterium* [*Bacterium*] *tumefaciens*) [*R.A.M.*, 32, p. 475]. Results suggested that to some extent the growth rate of tumour cells is independent of the growth rates of healthy host cells and tissues.

CASS SMITH (W. P.) & DOEPEL (R. F.). **Plant diseases. Crown gall of fruit trees and other plants. Black rot of Stocks.**—*J. Agric. W. Aust.*, Ser. 3, 1, 6, pp. 831–833, 835–836, 3 figs., 1952.

In the first of these papers (by Cass Smith) brief, popular notes are given on crown gall (*Agrobacterium* [*Bacterium*] *tumefaciens*) of fruit trees and other hosts in Western Australia [cf. *R.A.M.*, 30, p. 373; 31, p. 319] and its control [ibid., 31, p. 595] in nursery and orchard.

In the second paper (by Doepel) notes are given on the control of black rot of stocks [*Matthiola* spp.] caused by *Xanthomonas incanae* [cf. ibid., 27, p. 275; 30, p. 108].

Treggi (G.). **Azione di alcuni aminoacidi su Agrobacterium tumefaciens (Smith et Town.) Conn.** [Action of some amino acids on *Agrobacterium tumefaciens* (Smith & Town.) Conn.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1411–1419, 1 fig., 1952.

Studies *in vitro* of the antagonistic action of certain amino acids to *Agrobacterium* [*Bacterium*] *tumefaciens* [*R.A.M.*, 32, p. 69] demonstrated that *p*-aminobenzoic acid, aminovalerianic acid, *dl*-valine, and *dl*-tryptophane exert an inhibitory action related to the concentration of the acid and the quantity of inoculum used. The maximum effect for *p*-aminobenzoic acid was secured with 0·1 per cent.; at 0·05 per cent. a certain amount of growth took place if the inoculum was abundant. Histamine, not used as a nitrogen source, is tolerated if present in concentrations of not more than 0·2 per cent.; at higher ones it checks the development of *B. tumefaciens*. Certain amino acids, especially *l*-tryptophane, induce or tend to induce the development of the R phase in *B. tumefaciens*. In other words loss of pathogenicity in the presence of amino acids is related to the ability of these acids to induce the formation of the R phase.

Greenwood (M.) & Djokoto (R. K.). **Symptoms of mineral deficiency in Cacao.**—*J. hort. Sci.*, 27, 4, pp. 223–236, 2 pl., 1952.

This is a full account of work with nutrient solution cultures of cacao at the West African Cacao Research Institute, Tafo, Gold Coast, some of which has been reported from other sources [*R.A.M.*, 26, p. 335; 30, p. 459]. The chlorotic mottling characteristic of 'sickle leaf' (zinc deficiency) is interveinal, as distinct from the vein clearing and banding of swollen shoot virus mosaic.

Cacao proved highly sensitive to the absence of all the elements tested, well-defined symptoms of zinc, iron, manganese, boron, and calcium deficiencies being secured. When zinc alone was lacking the leaves of the third to the eighth flush bore a raised, distorted vein-pattern and were sickle-shaped. There was little or no shedding. When iron and zinc were both absent the leaves of the first to the third flush displayed a mild iron chlorosis, with a raised vein pattern and curvature. The leaves of the fourth to the sixth flush were curved, elongated, and whitish-green, with elliptical necrotic patches between the laterals; shedding occurred. When zinc and manganese were both omitted the leaves of the fifth to the seventh flush were elongated and laterally curved. The most acute symptoms were presented by plants lacking both zinc and iron, in which growth was much greater than in plants grown without iron only. Leaf dentation was reproduced in a greatly exaggerated form in complete nutrient maintained between pH 6·2 and 6·5. Increase in the potassium/calcium ratio in complete nutrient increased the weight of stems, in plants lacking iron it delayed the appearance of acute chlorosis, and in those lacking manganese it retarded growth and accelerated leaf-shedding.

Hansing (E. D.). **Seed treatment with new as compared with older fungicides for the control of Wheat, Oat, and Sorghum smut and Victoria blight of Oats in Kansas, 1950 to 1952.**—*Plant Dis. Reptr*, 37, 2, pp. 49–58, 1953. [Multilithed.]

In seed treatment tests on artificially infected Red Chief and Moking wheat, Red kafir sorghum, and Kanota oats at Kansas Agricultural Experiment Station, Manhattan, panogen (1·4 per cent. mercury) at $\frac{3}{4}$ oz. per bush., ceresan M ($\frac{1}{2}$ oz.), new improved ceresan ($\frac{1}{2}$), agrox ($\frac{1}{2}$), and vancide 51 (4 oz. or more) improved emergence and reduced wheat bunt (*Tilletia foetida*) [*R.A.M.*, 32, p. 308] to 1 per cent. or less, compared with 57 to 96 per cent. for the untreated. Panogen and new improved ceresan gave satisfactory control of oat smuts (*Ustilago avenae* and *U. kolleri*) [ibid., 32, p. 307]; ceresan M, agrox, and setrete were also adequate but the treated seed required a longer storage period. Panogen and new improved ceresan

were comparable in the control of *Helminthosporium victoriae* on oats, ceresan M requiring a longer storage period; all three improved emergence. Panogen, ceresan M, new improved ceresan, vancide (2 oz. or more), arasan (2 oz.), and spergon (2 oz.) all gave good control of sorghum kernel smut (*Sphacelotheca sorghi*) [ibid., 32, p. 310]. Vancide (4 and 6 oz.) and arasan were most effective in increasing emergence.

Panogen was recommended for seed treatment of wheat, oats, and sorghum in Kansas in 1951.

Machacek (J. E.). **Cooperative seed-treatment trials—1952.**—*Plant Dis. Reptr*, 37, 2, pp. 59–62, 1953. [Multilithed.]

In the 1952 trials at 16 stations in Canada and eight in the United States [cf. *R.A.M.*, 31, p. 545; 32, p. 307] 30 seed treatments were compared for the control of wheat bunt (*Tilletia foetida* and *T. caries*) [see preceding and next abstracts], using artificially infected Red Bobs seed, smuts (*Ustilago avenae* and *U. kolleri* on Vanguard oats [see preceding abstract and above, p. 542] and *U. hordei* [loc. cit.] and *U. nigra* on Sanalta barley, partly natural and partly artificial contamination), seedling blight (*Helminthosporium sativum*) of naturally infested Regent wheat, and [unspecified] rot of Royal flax seed of which 50 per cent. had been fractured during threshing. Control was considered satisfactory if there was less than 1 per cent. infection. The following were considered most effective in descending order of overall value: (1) ceresan M dust and slurry (0·5 oz. per bush., satisfactory against all except barley smuts) and spergon dust (2 oz., satisfactory against wheat bunt and seedling blight and oat smuts); (2) agrox C dust (0·5 oz.) and mergamma slurry (1·75 oz.), both effective against wheat bunt and oat smuts, panogen 14 fluid (0·75 oz., against all except barley smuts), setrete fluid (0·5 oz., against oat smuts and flax seed rot), and merlane slurry (2 oz., against wheat bunt and seedling blight and 1·43 oz. against oat smuts); (3) mema (0·5 oz., against oat smuts and wheat bunt and seedling blight) and merlane dust (wheat bunt and oat smuts).

Siang (W. N.) & Holton (C. S.). **Mode of action of hexachlorobenzene on Wheat bunt fungi in vitro.**—*Plant Dis. Reptr*, 37, 2, pp. 63–65, 1953. [Multilithed.]

Laboratory experiments were carried out conjointly by the Washington Agricultural Experiment Stations and the Bureau of Plant Industry, Division of Cereal Crops and Diseases, to determine the mode of action of hexachlorobenzene (HCB) vapour against the wheat bunt organisms (races 9 and 8, respectively, of *Tilletia caries* and *T. foetida*) [*R.A.M.*, 32, p. 73 and preceding abstracts]. Spores were unable to germinate after being kept in jars with 150 mg. HCB for seven days at 20° C. As HCB sublimes only slightly at room temperature the threshold vapour concentration necessary for complete inhibition of spore germination was not determined. The possible maximum concentration at 20°, however, appears to be not more than $14{\cdot}33 \times 10^{-7}$. In the field the rate of sublimation may be affected by the method of application, the nature of the filler, and the temperature, moisture, and texture of the soil.

Grasso (V.). **La vitalità dei clamidoconidi di alcuni Ustilaginali in prove di germinazione di laboratorio.** [The viability of the chlamydospores of certain Ustilaginales in laboratory germination tests.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1555–1564, 2 pl., 1952. [English summary.]

Laboratory tests carried out in 1951 and 1952 at the Phytopathological Station, Florence, Italy, demonstrated that spores of *Tilletia* spp. collected from wheat in 1943 and 1946 did not germinate at all and the same held for *Ustilago tritici* from

wheat, *U. avenae* from oats, and other smuts collected in 1947, whereas collections of *T.* spp. made in 1948, 1949, 1950, and 1951 and *U. tritici* (1951) germinated readily. Samples of *U. hordei* and *U. nigra* from barley collected in 1947 germinated regularly after three treatments with carbon disulphide. Carrot agar was used at 20° to 21° C. Many of the specimens, in accordance with herbarium routine, had been treated with carbon disulphide, and it is considered that failure to germinate may have been due to this treatment, though concentrations used for fumigating appeared to have no lethal effect on *Tilletia* spores.

Rapin (J.) & Terrier (C.). **La carie naine du Froment en Suisse romande au cours de la campagne 1951–1952.** [Dwarf bunt of Wheat in French Switzerland during the season 1951–1952.]—*Rev. rom. Agric.*, 8, 9, pp. 65–67, 1 diag., 1 map, 1952.

Dwarf bunt of wheat [*Tilletia brevifaciens*: see next abstract] is present in Switzerland [*R.A.M.*, 32, p. 301] throughout Val-de-Ruz (canton of Neuchâtel), in the area that extends from Gimel to Le Vaud (canton of Vaud), and in the region that includes the entire mountain district from Jorat to the north-east of Lausanne. There is an isolated centre at Orzens (Yverdon) and another at La Sommersheim sur Sonceboz (Bernois Jura). All these localities, except Orzens, are over 750 m. high [cf. ibid., 32, p. 241]. Other areas are probably also affected. Growers are advised to use only seed treated with an officially recognized preparation containing hexachlorobenzene or pentachloronitrobenzene. Fields not previously sown with wheat for seven years have been attacked.

Gassner (H. C.). **Der Steinbrand des Weizens und seine Bekämpfung.** [Bunt of Wheat and its control.]—*Flugbl. biol. Bundesanst. Braunschw.* D2, 6 pp., 6 figs., 1953.

This is a summary in popular terms of the available information on the symptomatology, etiology, and control of wheat bunt (*Tilletia tritici* [*T. caries*] and *T. levis* [*T. foetida*]), one of the commonest and economically most important cereal diseases in Germany. Observations are also made on the increasingly prevalent dwarf bunt (*T. caries* [or *T. brevifaciens*: see preceding abstract]).

Welter (R.). **Étude du naphtol et de quelques-uns de ses dérivés dans la lutte contre Tilletia tritici (carie du Froment).** [Study of naphthol and some of its derivatives in the control of *Tilletia tritici* (Wheat bunt).]—*Ind. chim. belge*, 17, 7, pp. 682–684, 1952.

Excellent control of wheat bunt (*Tilletia tritici*) [*T. caries*] was obtained in experiments at Marly, Belgium, by seed treatment with 10 per cent. 1,chloro-β-naphthol, which inhibited spore germination over a radius of 7·5 mm., the corresponding figures for β-naphthol and 1-tert-butyl-β-naphthol at the same dosage being 6 and 5·5 mm., respectively, and for 1·5 per cent. mercury methoxyethylsilicate (used as a standard) 6 mm.

Minz (G.) & Bental (A.). **Experiments on loose smut of Wheat and Barley.**—*Hassadeh*, 33, 2, pp. 113–116, 1952. [Hebrew.]

The indigenous durum wheat Nursit is very susceptible to loose smut (*Ustilago tritici*) in Israel [cf. *R.A.M.*, 32, p. 71], though otherwise suitable as a winter crop. In 1947–8 hot water treatment (10 min. at 53·5° C., after 4 hours' pre-soaking) entirely suppressed smut on an area of ½ acre, while there was 5 per cent. infection in the control plot.

The Tunisian barley variety is susceptible to loose smuts (*U. nuda* [ibid., 24, p. 185] and *U. nigra* [ibid., 30, p. 407]). In 1950–1 both smuts were entirely suppressed by hot water treatment (5 min. at 49°, 10 min. at 51·5°, after 4 hours'

pre-soaking), while there was 1·1 per cent. infection in the control. A 600 sq. m. plot sown after agrosan GN (2 gm. per kg.) treatment showed 0·7 per cent. infection with *U. nuda*, but *U. nigra* was eliminated. In the following season seed from these experimental plots was used without further treatment. That from the check plot gave 1·6 per cent. infection, while that from the hot water treated plot adjacent to it gave 0·05 per cent. loose smut.

Rashevskaya (Mme V. F.) & Nilova (Mme V. P.). Влияние активности каталазы на устойчивость Пшеницы при поражении бурой ржавчиной. [Influence of catalase activity on the resistance of Wheat to brown rust infection.]—Изв. Акад. Наук С.С.С.Р. [*U.S.S.R. Acad. Sci. News* = *Bull. Acad. Sci. U.S.S.R.*], *1952*, 4, pp. 63–67, 1952.

In greenhouse experiments carried out in the U.S.S.R. to determine how far the catalase activity of the leaf affects resistance of wheat to brown rust (*Puccinia triticina*) [*R.A.M.*, 30, p. 151] a study was made of the enzyme activity in various parts of healthy leaves, its direct relationship to the fungus on the host, and the effect of ageing of both healthy leaves and those having various parts infected. The results showed that catalase activity varied in different parts of the leaf, decreasing gradually from the tip towards the base, and was lowest in the youngest leaves. Rust developed more rapidly on leaf parts with greater catalase activity, which was increased by the infection not only in the diseased parts but also in uninfected parts surrounded by invaded tissues. A slight yellowing of the leaf tip of test plants was observed eight days after inoculation. In infected leaves tissue-ageing (starting from the tip) was much more rapid than in healthy ones where it led to a decrease in catalase activity. Infection of the leaf tips caused a more rapid ageing, yellowing, and dying of tissues, with a corresponding increase in catalase activity. The fungus developed more slowly near the leaf base, which is in accordance with the decrease of catalase activity from tip to the base.

McKinney (H. H.). **Soil-borne Wheat mosaic viruses in the Great Plains.**—*Plant Dis. Reptr*, 37, 1, pp. 24–26, 1953. [Multilithed.]

Soils from mosaic wheat fields in Iowa, Missouri, Kansas, and Oklahoma were tested with red winter spelt at Beltsville, Maryland, for possible soil-borne viruses [*R.A.M.*, 32, p. 370]. The test plant is the only one known to the writer which will develop symptoms when growing out of doors in November. Counties in which soil-borne mosaic viruses were detected and the year of the soil collection are listed for each State. Hodgeman County, Kansas, is the farthest west and Clemson, South Carolina, the farthest south where these viruses have been collected. The results indicated that the light green mottling and yellow mottling strains are present in all the active soil samples collected. All the soil-borne viruses that infected wheat when tested by manual inoculation only did so at low temperatures and failed to infect it at summer temperatures. Negative results were obtained with soil and inoculation tests with the wheat mosaic-rosette virus strain on Harvest Queen wheat. However, this variety and Michigan Amber developed pale green mosaic symptoms indistinguishable from those caused by this strain on Michigan Amber and from those of the plains' wheat green-mosaic virus [ibid., 24, p. 136], and closely resembling those induced by the non-rosetting green-mosaic viruses [ibid., 28, p. 280]. It is suggested that the plains' wheat mosaic viruses possibly overseason in the soil.

Sill (W. H.) & Fellows (H.). **Symptom expression of the Wheat streak-mosaic virus disease as affected by temperature.**—*Plant Dis. Reptr*, 37, 1, pp. 30–33, 1 graph, 1953. [Multilithed.]

Studies were carried out at the Kansas State College, Manhattan, to determine

the effect of controlled temperature upon the incubation period and symptom severity of the yellow strain of wheat streak mosaic virus [a strain of wheat mosaic virus: *R.A.M.*, 32, p. 74 and preceding abstract] on five wheat varieties. At air temperatures of 82° F., 75°, 68°, and 60° and also at 60° associated with a soil temperature of 46° the incubation periods were 5, 7, 9, 15, and 23 days, respectively. Symptoms were most severe at 82° in the early stages, but later became more severe at lower temperatures and were typically diffuse at 60° (soil 46°), Lee and Rival not showing clear symptoms though infective virus was obtained from them. Stunting was slight or absent at 68° and 60°, while at the three higher temperatures it ranged from 16 to 20 per cent. Mosaic symptoms, which are not always obvious, appear in the spring, their severity increasing with rising temperatures.

Gassner (H. C.). **Der Brand des Hafers und seine Bekämpfung.** [Smut of Oats and its control.]—*Flugbl. biol. Bundesanst. Braunschw.* D3, 4 pp., 4 figs., 1953.

Essential information on the symptomatology, etiology, and control of the loose and covered smuts of oats (*Ustilago avenae* and *U. kolleri*) in Germany is presented in popular form.

Fox (R. A.). **Heterothallism in Chaetomium.**—*Nature, Lond.*, 172, 4369, pp. 165–166, 1953.

During an investigation of the fungus flora of oat seeds in the Department of Mycology and Plant Pathology, Queen's University, Belfast, it was found that single ascospore isolations of *Chaetomium elatum* [*R.A.M.*, 29, p. 474] produced no fertile perithecia, only primordia. Fertile perithecia were obtained in some cases when these isolates were plated in pairs; of eight single spore cultures from a single perithecium three were of one type and formed perithecia when paired with any of the other five. Pairing of 122 isolates suggested that heterothallism may be effected by a multiple allelomorphic system.

Another heterothallic form isolated from oat seed agreed very closely with *C. olivaceum*, which was considered by Chivers (*Mem. Torrey bot. Cl.*, 14, p. 115, 1915) to be a synonym of *C. globosum*. But the fact that it is heterothallic and has larger ascospores indicates that *C. olivaceum* is a distinct species. This isolate and two homothallic isolates agreeing with *C. globosum* could be separated physiologically by their differing reactions to different sources of carbon in culture media.

Tveit (M.). **Control of a seed-borne disease by Chaetomium cochlioides Pall., under natural conditions.**—*Nature, Lond.*, 172, 4366, p. 39, 1953.

The investigations reported herein, carried out at the Imperial College of Science and Technology, London, are based on earlier work in the Division of Plant Pathology, University of Minnesota, which demonstrated that the severe blight of oat seedlings caused by *Helminthosporium victoriae* was prevented by introducing certain Brazilian isolates of *Chaetomium cochlioides* [cf. *R.A.M.*, 31, p. 222] into non-sterile soil.

In the latest experiments thirty oat seeds heavily infested with *Fusarium nivale* [*Calonectria nivalis*] obtained from the Norwegian Seed Testing Laboratory, Vollebekk, were placed in pots of medium loam on top of oat straw cultures of *Chaetomium cochlioides*, saturated with a 2 per cent. glucose solution, and covered with about 3 cm. soil. Three series were run in this way using strains A, B, and C of the antagonist, in another the seed was treated with an organo-mercurial fungicide, and the control had uninoculated oat straw. The percentages of healthy plants at the two- to three-leaf stage after five weeks at 13° to 16° C. were 87·2, 52·2, 0, 84·4, and 0, respectively, demonstrating the effectiveness of strain A. Oddly enough *C. cochlioides* is not strikingly antagonistic to *Calonectria nivalis* or other pathogens in pure culture.

Finkner (R. E.), Murphy (H. C.), & Atkins (R. E.). **Reaction of Oat varieties to powdery mildew.**—*Agron. J.*, 45, 3, pp. 92–95, 4 figs., 1953.

Powdery mildew (*Erysiphe graminis*) has not been reported to be present on oats under field conditions in Iowa, but in the autumn of 1950 a very severe outbreak occurred on greenhouse plants at the Agricultural Experiment Station, the source of infection being unknown. An opportunity was thereby afforded of determining the reaction to the disease of all available varieties and selections [*R.A.M.*, 27, p. 560], totalling 4,289. Using the scale applied by Mains and Dietz to the classification of barley mildew [ibid., 9, p. 370], with the further refinement of plus or minus values in some cases to denote heavier or lighter degrees of infection, none of the seedlings was rated as immune or highly resistant (type 0), but two, Landhafer (from Germany) and Missouri 04015, were very resistant (type 1); moderately resistant (type 2) were Red Rustproof[2] × Victoria-Richland, White Mildew Resistant (Welsh), Missouri 0–205 [ibid., 32, p. 247], Neosho × Landhafer, and 16 others; 37 were assigned to 2+, and the remaining 4,230 to types 3 or 4. Some of the resistant lines originated from crosses between susceptible parents.

Wilson (V. E.) & Murphy (H. C.). **Red leaf of Oats.**—*Plant Dis. Reptr*, 37, 1, pp. 21–23, 1953. [Multilithed.]

Investigations were carried out in 1951 at Ames, Iowa, on the red leaf disease of oats [*R.A.M.*, 31, p. 233], which was responsible for some 15 per cent. loss of oat crops in Iowa in 1949. Severity of the disease ranged from complete recovery of the plant to complete blasting of the panicle. The cause of the disease, which is characterized by reddening and early maturity of the plant and abnormally pale and low bushel-weight seed, is still unknown. The disease, favoured by high light intensity and low temperatures, is transmitted by soil and aphids (*Rhopalosiphum prunifolii*) [*R. insertum*: loc. cit.; ibid., 32, p. 240 and below, p. 554]. Greenhouse experiments have shown that it can be inhibited by heavy applications of nitrogen to the soil or by reduced light intensity and temperatures over 75° F. Of the 18 varieties tested for resistance in the field, Anthony-Bond × Boone was the most resistant and Clinton × Marion the most susceptible, the average numbers of infected plants per sq. m. being 2 and 8·7 per cent., respectively.

Hooker (A. L.) & Dickson (J. G.). **Resistance to Pythium manifest by excised Corn embryos at low temperatures.**—*Agron. J.*, 44, 8, pp. 443–447, 1 graph, 1952.

At the Wisconsin Agricultural Experiment Station, the embryos of two susceptible and three resistant maize inbreds and the 12 possible single and reciprocal hybrid combinations from them were excised at five three-day intervals during germination at 12° C. and evaluated for resistance to *Pythium debaryanum* [*R.A.M.*, 31, p. 14] by a method devised to facilitate a direct comparison between contrasting seed lots. These were placed on different halves of a potato dextrose agar culture of the fungus, the embryos removed after the allotted time, surface-sterilized, and replated on a synthetic medium for one or two days' growth at room temperature, when they were allotted a resistance rating of 0 to 3. A resistance index was determined for each replicate unit by totalling the ratings for the five embryos. In addition, embryos of the inbred lines were tested at 12-hour intervals during germination at 24°.

The embryos became progressively more resistant to the fungus as the period of germination increased up to 12 days; by the 15th day all were relatively resistant. Resistance was acquired much more rapidly by the embryos of resistant than by those of susceptible inbreds, the highest rate being among single crosses. The reaction of single-cross embryos to infection by *P. debaryanum* was closely correlated with the average reaction of their parents, especially the pistillate. Differences between reciprocal hybrids were generally small. Stand density and seedling

vigour following sowing in cold soils depended largely on the resistance of the embryos to attacks of the pathogen.

Ullstrup (A. J.). **Observations on crazy top of Corn.**—*Phytopathology*, 42, 12, pp. 675–680, 2 figs., 1952.

The observations on crazy top of maize [*R.A.M.*, 32, p. 427] herein reported from the Purdue Agricultural Experiment Station, Lafayette, Indiana, cover a period of several years, during one of which (1949) the disease was exceptionally prevalent, affecting some 75 per cent. of the plants in a seven-acre area.

Flooding of the soil at a period between planting and the three- to four-leaf stage appears to be essential to infection, which was found on two additional hosts, *Digitaria sanguinalis* and *Panicum capillare*. All the above-ground portions of the diseased plants contained intercellular mycelium. Haustoria were not detected and there was no apparent necrosis of the host cells. True sporangiophores or sporangia did not develop but short hyphae, suggestive of abortive sporangiophores, protruded from the stomata. Oogonia and oospores, resembling those of *Sclerospora macrospora* [cf. ibid., 29, p. 462], were abundant in severely diseased plants.

These observations, together with the similarity of crazy top to a maize disease caused by *S. macrospora* in Italy [cf. ibid., 29, p. 611], are considered to afford circumstantial evidence of the etiological relation of the fungus to the disease. Inoculation experiments on known hosts of *S. macrospora* gave negative results.

Stoner (W. N.). **Leaf fleck, an aphid borne persistent virus disease of Maize.**—*Phytopathology*, 42, 12, pp. 683–689, 2 figs., 1952.

Leaf fleck, a hitherto unreported, persistent, aphid-borne virus affecting maize in the north-east shore area of San Francisco Bay, California, is described as *Corium zeae* n.sp.

Four to eight (mostly six) weeks after inoculation by means of *Rhopalosiphum prunifolii* [*R. insertum*: see above, p. 553], Golden Bantam maize plants develop roughly circular, pale spots between the veins at the tip of the oldest leaf; they gradually enlarge to a diameter of 2 mm. and turn yellow. Spots then begin to appear towards the leaf base and may cover 1 to 2 in. of the leaf length daily; when the terminal third is spotted burning of the tip and margins commences. The yellow tissue turns orange in three to four days and necrosis ensues, the first affected leaf being dead within a week to ten days from the appearance of the initial symptoms. The symptoms pass upwards in a regular vertical sequence, involving alternate leaves, a fresh leaf becoming infected every two or three days. Viewed in sunlight two to three weeks after the onset of infection a uniform speckled or flecked aspect is apparent, which suggested the name of 'leaf fleck' for the disease.

Besides *R. insertum*, *R. maidis* and *Myzus persicae* were shown by transmission tests to serve as vectors of the virus, the acquisition and inoculation thresholds of which in *R. insertum* lay between five and ten minutes and very close to five minutes, respectively. There was no measurable latent period in *R. insertum*, but six days' retention was demonstrated in tests with *M. persicae*. The leaf fleck virus was not transmissible mechanically nor did it appear to be seed- or soil-borne. It was conveyed by *R. insertum* to barley, oats, and *Phalaris tuberosa* var. *stenoptera*, but transferred back to maize only from the last-named, which may well constitute a natural source of the virus for early spring infection of maize.

Steyaert (R. L.) & Van Laere (R.). **La 'cannelure' ou 'stem pitting' du Pamplemoussier au Congo belge.** ['Cannelure' or stem-pitting of Grapefruit trees in the Belgian Congo.]—*Bull. agric. Congo belge*, 43, 2, pp. 447–454, 5 figs., 1952. [Flemish summary.]

In 1949 symptoms agreeing perfectly with those of stem-pitting in South Africa

[*R.A.M.*, 29, p. 23; cf. 32, p. 428] were detected on grapefruit trees growing at the Vuazi Station, Lower Belgian Congo. It is considered that the disease is either indigenous to the region or was introduced there long ago, probably from South Africa.

Rebour (H.). **Le choix d'un porte-greffes pour Agrumes.** [The choice of a stock for Citrus.]—*Fruits Prim. Afr. N.*, 23, 244, pp. 59–60, 3 figs., 1953.

While citrus quick decline has not yet appeared in the Mediterranean basin [*R.A.M.*, 31, p. 432], citrus trees in French North Africa are grafted on sour orange, which is known to be susceptible, and the author briefly discusses whether trees for new plantations should or should not be on Cleopatra mandarin stocks, the only suitable alternative available [ibid., 31, p. 63, and next abstract].

Rebour (H.). **Le greffage du Clémentinier sur Poncirus.** [The grafting of Clementine on *Poncirus*.]—*Fruits Prim. Afr. N.*, 23, 244, p. 79, 1953.

In view of the possibility that citrus grafted on sour orange in French North Africa may at some time become affected by quick decline [see preceding abstract], the suggestion has been made that clementine [citrus hybrid] should be grafted on *Poncirus trifoliata*, which is less susceptible to the virus than other stocks. This stock grafted with healthy scions gives good yields of excellent clementines, but it may also cause marked dwarfing, due to exocortis virus in the scions [*R.A.M.*, 31, p. 382], which are symptomless.

Batchelor (L. D.) & Calavan (E. C.). **What's the matter with Lemon trees.**—*Citrus Leaves*, 32, 1, pp. 6–9, 42, 1952. [Abs. in *Biol. Abstr.*, 27, 1, p. 235, 1953.]

Studies at the California Citrus Experiment Station and in commercial orchards on the resistance of lemon strains to lemon decline disease [*R.A.M.*, 31, p. 432] indicated that no Eureka strain tested appeared to be promising. Some Lisbon strains, especially short-thorned types, were resistant, whether the rootstock was sweet or sour orange. Promising Lisbon strains were Prior, Keen, Monroe, and Price, parent trees of which were in good condition though 40 to over 60 years old.

Calavan (E. C.), Wampler (E. L.), Sufficool (J. R.), & Ormsby (H. W.). **Gray mold infections.**—*Citrus Leaves*, 32, 4, pp. 10–11, 1952. [Abs. in *Biol. Abstr.*, 27, 1, pp. 236–237, 1953.]

In tests at the California Citrus Experiment Station with various fungicides the best control of grey mould blossom blight (*Botrytis cinerea*) on lemons [*R.A.M.*, 25, p. 558] was given by ferric dithane D-14, but the residual effect lasted for only 14 days. Visible infections were significantly reduced by spraying with water to dislodge the affected parts; this was effective for 12 days.

De Carvalho (T.) & Mendes (O.). **Uma cercosporiose em Citrinos.** [A cercosporiosis of *Citrus*.]—Reprinted from *Moçambique, 1952*, 72, 8 pp., 11 figs., 1952.

A species of *Cercospora* attacking sweet oranges at Angola, Mozambique, may be recognized on the host by dense tufts of light chestnut-coloured, multiseptate conidiophores, 27 to 118 by 2·7 to 3·1 μ, terminating in subclaviform or sometimes straight, uni- to sexseptate conidia, 24 to 80 by 3·2 to 6·9 μ. In pure culture on malt agar isolates from the leaves gave rise to almost uniformly straight, tri- to sexseptate conidia measuring 55 to 84 by 4·7 to 5·5 μ. The fungus produces on the foliage circular, solitary lesions up to 4 mm. in diameter, ashen to chestnut coloured, lustrous, and prominent on the upper surface and ashen to dark, turning black, with a velvety coating on the lower. Each spot is surrounded by a chlorotic halo,

and in severe cases the leaves present a yellow appearance due to the toxins secreted by the fungus. On the fruits the discrete or coalescent spots measure up to 2 cm. in diameter; the dark chestnut, coriaceous, later corky, prominent, brittle centre is encircled by a halo of a darker green than the peel. Secondary anthracnose [*Colletotrichum gloeosporioides*] infection develops in the outer zone. A few conidiophores are produced in the centre of new spots on the fruits but conidia are formed only on the lower leaf surfaces. The disease, which appears to be new to Africa south of the Equator, is potentially serious and requires further study.

Haas (A. R. C.). **Symptoms of molybdenum deficiency.**—*Citrus Leaves*, 32, 5, pp. 6, 7, 18, 1952. [Abs. in *Biol. Abstr.*, 27, 1, p. 235, 1953.]

Culture studies carried out at the California Citrus Experiment Station indicated that minute concentrations of molybdenum stimulate a healthy growth of lemon and orange trees or rooted cuttings, though slightly higher concentrations retard growth or cause other injury [cf. *R.A.M.*, 32, p. 17]. The optimum concentrations varied with the type of culture but mostly lay within the range 0 to 1 p.p.m. After some years of such culture yellow leaf spot developed. Affected leaves were low in calcium, somewhat low in magnesium, but very high in potassium, having approximately the same composition as the leaves of citrus trees in Florida reported to have improved after molybdenum spraying [loc. cit.].

Fraselle (J. V.) & Geortay (G.). **Une grave maladie du Caféier 'Robusta' : la trachéomycose. Avertissement et conseils aux planteurs.** [A serious disease of *Robusta* Coffee bushes: tracheomycosis. Warning and advice to planters.]—*Bull. Inform. Inst. Etud. agron. Congo belge*, 1, 1–2, pp. 87–102, 6 figs., 1952.

A full account is given in semi-popular terms of the symptoms, causal organism, manner of spread, and control of tracheomycosis of *Robusta* coffee (*Gibberella xylarioides*) [*R.A.M.*, 31, pp. 63, 422] in the Belgian Congo. A constant watch should be kept for the first signs of infection, and the affected trees should be tagged immediately and sprayed with a 10 per cent. aqueous solution of carbolineum or strong Bordeaux mixture, dug up, and burnt *in situ*, carbolineum being sprayed or sprinkled on to the upturned soil and the uncovered roots. Infected material should on no account be carried about the plantation. Every diseased tree must be destroyed, even if it appears to be only slightly infected.

Gubanov (G.). **Die Bestimmung der Widerstandsfähigkeit der Baumwollpflanze gegenüber der Gommose.** [The determination of resistance to gummosis in the Cotton plant.]—Хлопководство [*Cotton Industry*], *1952*, 8, pp. 41–45, 1952. [Abs. in *Chem. Zbl.*, 124, 21, p. 3264, 1953.]

The tissues of cotton varieties resistant and susceptible, respectively, to gummosis [blackarm: *Xanthomonas malvacearum*] were shown by studies at a research and plant-breeding institute in the U.S.S.R. [*R.A.M.*, 32, p. 140] to contain different coloured pigments, those of the former being pale yellow and those of the latter brownish. Seed treatment with an alkali solution reduces the propensity to cotyledonary gummosis.

Young (V. H.) & Beacher (R. L.). **Crinkle leaf of Cotton, a result of manganese toxicity.**—*Arkans. Fm Res.*, 1, 2, p. 7, 2 figs., 1952.

Crinkle leaf of cotton in Arkansas, due primarily to manganese toxicity [*R.A.M.*, 18, p. 23], may be alleviated temporarily in fields not previously limed by side-dressing affected plants with 500 lb. hydrated lime per acre or 1,000 lb. finely

pulverized limestone. Experiments on Hagerstown soil demonstrated that the condition may occur even in soils limed to neutrality if they are heavily compacted and wet during most of the season. Generally speaking, the pH should be raised to 6 or 6·5, drainage improved where necessary, and every effort made to improve the soil structure and the supply of organic matter.

Lombardi (P. Lorenza). **Studio sul calcino del Baco da Seta.** [A study of the muscardine disease of the Silkworm.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1447–1473, 1952. [English summary.]

Studies carried out at the Experiment Station for Mulberry and Silkworm Culture, Ascoli Piceno, Italy, on the muscardine disease (*Botrytis* [*Beauveria*] *bassiana*) [*R.A.M.*, 6, p. 726; 21, p. 289] of silkworms [*Bombyx mori*] demonstrated that the spores remained viable for not more than twelve months [ibid., 18, p. 521]. In inoculation experiments young spores gave rise to more infections than old ones, but cultures from the latter were as virulent as young spores. The best culture medium was sugared water. The spores are able to live in manure heaps, in which they increase even during the season when silkworms are not being reared. Healthy silkworms which have survived from severely infected breeding grounds do not transmit any immunity to their direct descendants. The cross 'S.A.' No. 2× 'Maiella' and the reciprocal never had more than 8 per cent. mortality from the disease even in an infected environment.

De Wit (J. J. D.) & Verster (Anna J. M.). **Observations on Lebistes reticulatus.**—*Nature, Lond.*, 172, 4371, pp. 247–248, 1953.

Following an infection by *Saprolegnia* sp. [*R.A.M.*, 28, p. 126], during which 70 per cent. of the fish (*Lebistes reticulatus*) in an aquarium at the University of the Orange Free State, Bloemfontein, South Africa, were killed, sex reversal took place, 41 medium-sized sexually mature females which survived becoming male. It is suggested that toxins secreted by the pathogen were probably responsible.

Cruickshank (I. A. M.) & Wright (G. M.). **Resistance of Linseed and Linen-flax varieties to Flax-rust (Melampsora lini) in New Zealand. III.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 5, pp. 397–404, 1953.

In further greenhouse studies at the Department of Scientific and Industrial Research, New Zealand [cf. *R.A.M.*, 31, p. 328], on flax resistance to races 1 to 12 (excluding race 5) of rust (*Melampsora lini*) [ibid., 32, p. 378] 69 varieties were tested. I.F.22450/30, Morye, Argentine Selection, United States Rio, Russian× Argentine Seln., and I.F.812 were highly resistant and ten were resistant. As a result of the discovery of race 12 [ibid., 32, p. 80] Ottawa 770B, Sheyenne, Stakhanovitz, D-83, 806/3, Wada, Cascade, and Argentine II, previously regarded as resistant, are now classed as susceptible.

Spielrein (R. E.) & Brady (C. J.). **A comparison of resistance to fungal attack of retted Kenaf, decorticated Kenaf and Jute.**—*C.S.I.R.O. Plant Fibre Sect. Proj.* F. 4–3, *Progr. Rep.* 2, 8 pp., 1953. [Abs. in *Abstr. Publ. Pap. & List Transl.*, 1, 6, p. 4, 1953.]

The elimination of retting in obtaining fibres from kenaf (*Hibiscus cannabinus*) in Australia may increase their susceptibility to fungus attack. In soil burial and accelerated [unspecified] mildew infection tests samples of retted and unretted kenaf and retted jute did not differ in their susceptibility to cellulose-destroying fungi but yarns from decorticated, unretted kenaf were much more disfigured by non-cellulolytic fungi than the other two types.

Muskett (A. E.). **The seed-borne pathogens of Flax and their control.**—*Proc. IInd int. Congr. Crop Prot.*, pp. 297–303, ? 1951.

Most of the information reviewed here on the work done in Northern Ireland during the 12-year period 1938–1950 on the seed-borne fungal pathogens of flax and their control has already been noticed [*R.A.M.*, 28, p. 215; 29, p. 520, *et passim*].

Williamson (C. E.). **Powdery mildew control on some ornamental plants.**—*N.Y. St. Flow. Gr. Bull.* 93, pp. 2, 4, 1953.

Trials for the control of powdery mildews on ornamental plants [see next abstract] were carried out at Cornell University, New York. An organic fungicide and three sulphur materials were either ineffective or caused severe plant injury at effective rates of application. Iscothan [*R.A.M.*, 31, p. 435], now known as mildex, was consistently superior in eradicating snapdragon [*Antirrhinum majus*] mildew [*Oidium* sp.: ibid., 27, p. 78 and next abstract] and at 4 oz. per 100 gals. gave excellent control without plant injury. In greenhouse trials at temperatures below 80° F. from February to April, 1952, two applications of 15 per cent. iscothan (4 oz. per 100 gals.) plus a wetting agent [triton] B 1956 (6 oz.) gave excellent control of mildews on *Calendula* [*Sphaerotheca fuliginea*: ibid., 32, p. 380] and *Delphinium* [*Erysiphe polygoni*: ibid., 27, p. 477], an unidentified mildew on *Gerbera*, and *Oidium* on *A. majus*, while one application was sufficient against those on chrysanthemum [*Erysiphe cichoracearum*], *Euonymus* [*O. euonymi-japonicae*: ibid., 27, p. 422], hydrangea [*Microsphaera polonica*: loc. cit.], rose [*Sphaerotheca pannosa*: see next abstract], and an unidentified mildew on *Saintpaulia*.

Dimock (A. W.). **Emergency powdery mildew control.**—*N.Y. St. Flow. Gr. Bull.* 93, p. 3, 1953.

A thorough, heavy application of iscothan (mildex) [see preceding abstract] at 2 oz. per 100 gals. plus dreft (8 oz.) to ensure complete wetting of the mildew growth, followed half an hour later by clear water syringe to wash off the deposit and prevent possible bloom injury, was effective in controlling powdery mildew [*Oidium* sp.: loc. cit.] on snapdragon [*Antirrhinum majus*], rose [*Sphaerotheca pannosa: R.A.M.*, 30, pp. 370, 610], and begonia [*O. begoniae*: ibid., 31, p. 434] in New York State.

Baker (K. F.) & Sciaroni (R. H.). **Diseases of major floricultural crops in California.**—California State Florists' Association, 57 pp., 1952.

Short, practical notes are given on the symptoms, cause, and control of the most important diseases affecting 15 major floricultural crops in California.

Jones (W.) & Orchard (W. R.). **Check list of fungus and bacterial organisms causing diseases of ornamental plants in British Columbia coastal areas.**—Dominion Laboratory of Plant Pathology, Saanichton, B[ritish] C[olumbia], 9 pp., [? 1952. Mimeographed.]

This check list of fungal and bacterial diseases of ornamentals in British Columbia coastal areas is arranged in alphabetical order of scientific names of the disease organisms under group headings, e.g., downy mildews, powdery mildews, rusts and smuts. Under each disease is given the scientific and common names of the host or hosts, local distribution, part of host affected, and degree of damage caused or type of symptom.

NOORDAM (D.). **Lycopersicum-virus 3 (Tomato spotted wilt) bij enkele bloemisterijgewassen.** [*Lycopersicum* virus 3 (Tomato spotted wilt) in some ornamental plants.]—*Tijdschr. PlZiekt.*, 58, 4, pp. 89–96, 1 pl., 1952. [English summary.]

Of recent years tomato spotted wilt virus [see next abstract] has been found to cause considerable damage to chilli, *Impatiens holstii*, cineraria, and gloxinia (*Sinningia hybrida*) in Holland [*R.A.M.*, 14, p. 107; 26, p. 34]. The disease occurred exclusively in nurseries containing *Campanula isophylla*, which probably, therefore, served as the source of infection. This plant usually displays only an inconspicuous foliar wrinkling and small, pale green spots with faint margins, but sometimes the leaves are patterned with a mosaic of pale, normal, and dark green areas, while characteristic circles and irregular lines often develop towards flowering time. *C. pyramidalis* [ibid., 13, p. 133] was more severely infected than *C. isophylla*, the symptoms including leaf necrosis. The identity of the virus was established by sap inoculation experiments on White Burley tobacco, *Nicotiana glutinosa* and other *N.* spp., and *Petunia hybrida*, the symptoms developing on which are described.

Cinerarias react very variably to infection by tomato spotted wilt virus [ibid., 12, p. 730], striking manifestations of which include the intersection of the leaves by pale green bands with occasional spots of normal green, tending to spread out fanwise near the margins; numerous darker green, bizarre, hieroglyphic spots on normal or pale green leaves; paler green or yellow spots, 5 to 10 mm. in diameter, with brown, necrotic veinlets; and lesions with a necrotic centre, 1 mm. in diameter, with a surrounding ring measuring 10 to 15 mm., the intervening tissue remaining green. In budding and flowering plants the most conspicuous symptom is the veinlet necrosis, which may extend into the larger veins, petiole, and stem, sometimes proving lethal. Of 15 cineraria plants inoculated with infective sap from *N. glutinosa* and *I. holstii*, six developed symptoms, including flower striping. None of the 92 seedlings raised from diseased cinerarias showed any symptoms.

Only one of the indicator plants inoculated with sap from *Begonia tuberhybrida* [ibid., 13, p. 133] became diseased.

NOORDAM (D.). **Virusziekten bij Chrysanten in Nederland.** [Virus diseases of Chrysanthemums in Holland.]—*Tijdschr. PlZiekt.*, 58, 5, pp. 121–189, 8 pl. (4 col.), 1 fig., 1952. [English summary.]

This important study at the Phytopathological Research Institute, Wageningen, on the viroses of *Chrysanthemum indicum*, which have increased substantially in Holland since 1945 with the introduction of new English and American varieties, involved an examination of the symptoms of 394 diseased plants of 116 varieties. The identity of the viruses was determined by sap inoculations on a number of indicator plants. The two most common viruses were a strain of *Cucumis* virus 1 [cucumber mosaic virus: *R.A.M.*, 30, pp. 231, 507], herein designated strain *Chrysanthemum* (st. Chr.), and an unknown one termed virus b, occurring in 183 and 120 plants, respectively; chrysanthemum stunt virus [ibid., 31, p. 608 and next abstract] was also found, though much less frequently, while another undetermined virus, c, was present in one plant of the Samaria variety.

Symptoms of the chrysanthemum strain were apparent on all the affected varieties, sometimes on both flowers and leaves, in others on the former only. In some varieties infected by virus b both flowers and leaves were abnormal, in others the symptoms were either floral or foliar, while eight were symptomless; plants of Miss Wilcox and Desert Song either retained the normal reddish-brown flower coloration or produced yellow-striped or yellow flowers. The constancy of the three colour forms in the progeny suggests that virus b is composed of several strains differing in the intensity of the symptoms they induce.

Stunting was common to plants containing st. Chr., b, and stunt viruses, and it is, moreover, a feature of faulty nutrition and vascular diseases, so that, taken by itself, it cannot be regarded as a dependable diagnostic criterion. Mosaic mottling of the leaves developed in Carefree, Mayford Orange, Royal Bronze, Sartre, Smiles, Yellow Cleone, and Yellow Utopia infected by st. Chr. and in Samaria with virus b. A definite ring pattern on the leaves was characteristic of virus b infection in Dorothy Jackson, Enchantress, Samaria, Shirley Ivory, Source d'Or (sometimes in combination with st. Chr.), of st. Chr. in Perfection, Smiles, Sweetheart, and Tempest, and of the two together in Exmouth Pink. Virus b caused necrotic leaf spotting of American Schlager, Enchantress, and Good News, as did st. Chr. on Novemberzon and Red Rolinda, while necrotic rings were formed on Exmouth Pink and Mayford Pink leaves harbouring both viruses. Severe foliar malformation was a symptom of st. Chr. plus virus b in Mayford Orange and of the former alone in Pink Ideal and Royal Bronze. The colour of red-, bronze-, and brown-flowered varieties turns partially or entirely yellow as a result of infection by virus b, e.g., in American Schlager, Bronze Adonis, Bronze Delight, and Mason's Red; by st. Chr. in Aalsmeers Glorie, Arnhem, Bronze Ideal, Carefree, Corona, Crimson Crown, Prelude, Red Matador, Red Rolinda, Royal Bronze, Sartre, September Bronze, Tempest, and Typhoon; and by the two combined in Amber Bright, Red Mary Elisabeth, and William Meadows. St. Chr. was responsible for white spotting or total whiteness in the flowers of the following purple or pale red and pink varieties: August Pink, Deuil de Louis Barthou, Elegance, Exmouth Pink, Miss Helen Frick, Pink Ideal, Rose Chocod, Ruby, and Say Edgar, while a similar absence of pigmentation was typical of virus b in Enchantress. Mayford Pink, Smiles, and Sweetheart assumed a pale yellow tinge in consequence of invasion by st. Chr. White chrysanthemums are never, and yellow ones seldom, discoloured by virus infection. Where there is no floral discoloration a diagnosis may be based on deviations in the length of the ray florets as well as on stunting and foliar anomalies. Unequal length, lumpiness, and ruffling of the rays [loc. cit.] were the result of infection by st. Chr. in Balcombe Glory, Blanche Poitevine, Deuil de Louis Barthou, Duke of Kent, Golden Mary Elisabeth, Good News, Imperial Yellow, Little America, Perfection, Rayonnante, Snowfall, Source d'Or, Sweetheart, Tempest, and Typhoon, and of virus b in Yellow Miss Wilcox, Mont Blanc, and Shirley Ivory.

St. Chr. was transmissible to 16 of 35 species of plants, of which White Burley tobacco, *Nicotiana glutinosa*, and a dwarf form of *Petunia hybrida* proved to be the best indicators. The strain differs from the type in causing little or no reaction in gherkin and provoking severe leaf malformation and narrowing in *N. glutinosa*.

Seven out of 31 species of plants reacted positively to virus b. The local symptoms on *P. hybrida* were a useful indication of infection, provided st. Chr. was not also present in the test plant. The few (never more than ten) dark spots which may appear on *Helichrysum bracteatum* var. *monstrosum* after 12 to 16 days are a striking symptom of virus b, but they often fail to develop. *N. glutinosa* occasionally showed faint mottling, but all attempts to transmit the virus to tobacco were unsuccessful.

Virus b was inactivated by ten minutes' exposure to a temperature between 70° C. and 80° during the winter, and at other times at 50° to 70°. It was found impossible to purify the virus by centrifugation and precipitation with ammonium sulphate, for which alcohol was accordingly substituted with more satisfactory results. The presence of virus b in chrysanthemums was demonstrated by means of the precipitin reaction, infected sap reacting positively to antiserum diluted up to a maximum of 1 in 32. The rod-shaped particles, 600 by 30mμ, in electron micrographs in infected but not in healthy sap may be those of virus b.

None of the 23 plant species inoculated with chrysanthemum stunt virus gave a positive response. Its presence was demonstrable in Clara Holford, Indianapolis Yellow, and Pink Long Island Beauty by grafting diseased scions on to healthy Blazing Gold by Brierley and Smith's method (*Flor. Rev.*, 107, pp. 27–30, 1951), but this procedure is inapplicable if the infective material also harbours st. Chr. or virus b.

In preliminary tests virus c was transmitted to the Celestial variety of *P. hybrida*, *N. glutinosa*, and tobacco, the first-named developing, a fortnight after inoculation, necrotic spots and very characteristic, often concentric rings, which continued to appear during the following weeks. The uninoculated leaves were marked with yellow to white lines, sometimes circular but frequently forming bizarre or acute-angled patterns.

Tomato spotted wilt virus [see preceding abstract] was transmitted experimentally from tobacco to one out of 16 chrysanthemum plants, on which it has not yet been observed to occur naturally in Holland.

Some practical conclusions arising from these studies are briefly summarized for the guidance of growers.

Brierley (P.). **Steps to the goal of virus-free Mums.**—*Flor. Exch.*, 118, 21, pp. 9, 45, 1952. [Abs. in *Biol. Abstr.*, 27, 1, p. 234, 1953.]

When 147 varieties or breeding lines of chrysanthemum were graft-indexed on varieties of mistletoe [*Phoradendron*], 34 lines were discarded for stunt virus [see preceding abstract], 15 for mosaic virus [*R.A.M.*, 31, pp. 239, 284], and two for aster yellows virus [loc. cit.]; no rosette or tomato aspermy virus [loc. cit.; ibid., 32, p. 483] was detected. Mosaic virus was much more prevalent in older than in newer varieties. A nucleus of re-selected virus-free lines was retained.

Scaramuzzi (G.). **L'alternariosi dei petali di Garofano.** [Alternariosis of Carnation petals.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1587–1595, 1 col. pl., 4 figs., 1952. [English summary.]

In 1950 the petals of carnations of all varieties and colours growing in the vicinity of San Remo developed infection by *Alternaria dianthicola* [*R.A.M.*, 32, pp. 80, 128]. The damage caused was not usually serious except when the plants were attacked simultaneously by an *Alternaria* sp. [*A.* ? *dianthi*: loc. cit. and next abstract] affecting the stems, branches, and leaves. The outermost petals of fully opened flowers developed a discoloration, more conspicuous on dark than on pale flowers, which in two or three days or less affected a large part of the petal. At the centre of the affected area the tissues dried and became a pale hazel-nut colour. In dry conditions the disease progressed slowly and affected petals bore one or several discoloured areas up to 3 cm. wide, often round, pale brown, dry, with pale concentric zones, sharply distinguished from the healthy tissue and sometimes surrounded by a halo, usually white. The petals appeared deformed and in many cases contorted, and the commercial value of the flowers was much reduced. In wet conditions, particularly in glasshouses, progress of the disease was rapid and most of the petals withered. The affected areas were often dark-olivaceous owing to abundant fungal fructification. Apparently healthy buds stored in damp conditions often became diseased when they opened. Inoculations of carnation petals with *A. dianthicola* gave positive results. Control is recommended, as previously suggested [loc. cit.], by spraying with zineb, ziram, or copper 8-quinolinolate preparations, such as bioquin 1. Materials of this last group have the advantage of controlling not only *Alternaria* spp. but also *Uromyces caryophyllinus* [*U. dianthi*] which has recently assumed much importance as a disease of carnations on the Ligurian Riviera [ibid., 29, p. 260].

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Moreau (Mireille). **Les maladies de dépérissement des Oeillets dans la région de Nice.** [Carnation wilt diseases in the vicinity of Nice.]—*Rev. hort., Paris*, 125, 2194, pp. 907–909, 5 figs., 1953.

Of the wilt fungi affecting field carnations in the region of Nice, France, the most serious is *Sclerotium bataticola* [*Macrophomina phaseoli: R.A.M.*, 32, p. 190]. In several places the varieties Zazou, Suprême, and Cerise were attacked by *Fusarium dianthi* [ibid., 17, p. 182] and *F. roseum*. On three occasions *Phytophthora cactorum* [ibid., 17, p. 248] was isolated from young Cerise plants. *Rhizoctonia* [*Corticium*] *solani* [ibid., 31, p. 227] was obtained from the collars of Anita plants and from cuttings of several varieties. Other important wilt pathogens were *Alternaria dianthi* and *A. dianthicola* [ibid., 32, p. 190 and preceding abstract]. The high incidence of these pathogens is attributed to a poor nutritional balance which renders the plants incapable of resisting repeated invasion. Improved cultural conditions and the use of resistant varieties should assist in saving the plantings.

Scurti (J.). **Contributo alla conoscenza del giallume dei Gladioli.** [A contribution to the knowledge of *Gladiolus* yellows.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1705–1714, 2 pl., 1952. [English summary.]

In recent years numerous cases of *Gladiolus* yellows accompanied by corm and root rot have occurred in Italy. Isolations from young corms in an early stage of infection gave *Fusarium orthoceras* var. *gladioli* [*F. oxysporum* f. *gladioli: R.A.M.*, 29, p. 261; 30, p. 107, and next abstract] and a Gram-negative bacterium 1·5 to 2 μ long which produced whitish colonies. Inoculations of healthy *Gladiolus* corms with the two organisms separately and together demonstrated that the fungus was definitely pathogenic; the pathogenicity of the bacterium remained uncertain.

Scurti (J.). **L'ossichinolina nella lotta contro la malattia del giallume dei Gladioli.** [Oxyquinoline in the control of *Gladiolus* yellows.]—*Ann. Sper. agr.*, N.S., 6, 6, pp. 1715–1720, 1952. [English summary.]

In *in vitro* tests at the Stazione Chimico-Agraria Sperimentale, Turin, on the control of *Fusarium orthoceras* var. *gladioli* [*F. oxysporum* f. *gladioli*: see preceding abstract] 8-oxyquinoline sulphate at concentrations not weaker than 1 in 25,000 inhibited mycelial development, while 1 in 1,000,000 to 1 in 50,000 exerted a very slight effect. When the soil of potted plants grown from diseased corms in the open was sprinkled with 5 l. of a 1 in 1,000 solution twice a week during the first month and once a week in the second, 30 plants grew from 100 bulbs planted, and 26 flowered normally; with 1 in 4,000, 30 emerged and 24 flowered normally, while 25 out of 100 untreated emerged, 15 grew, and 8 flowered to some extent. Further work is to be carried out.

Goss (Olga M.). **Corm rots of Gladioli.**—*J. Agric. W. Aust.*, Ser. 3, 2, 2, pp. 245, 247, 249–253, 11 figs., 1953.

Notes, with brief general directions for control, are given on the symptoms of the following corm rots of *Gladiolus* in Western Australia: bacterial scab and neck rot (*Pseudomonas marginata*) [*Bacterium marginatum: R.A.M.*, 28, p. 455], hard rot (*Septoria gladioli*) [loc. cit.], dry rot (*Sclerotinia gladioli*) [loc. cit.], core rot or grey mould (*Botrytis* [? *cinerea*: cf. ibid., 29, p. 306]), *Fusarium* rot (*F. oxysporum* [f. *gladioli*: ibid., 25, p. 303 and preceding abstracts]), and *F.* yellows (*F. orthoceras*) [*F. oxysporum* f. *gladioli*]) [ibid., 32, p. 255].

Fry (P. R.). **Two virus diseases of Gladiolus.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 5, pp. 460–464, 3 figs., 1953.

An account is given of the symptoms of a strain of pea mosaic and cucumber mosaic viruses on gladiolus in New Zealand [*R.A.M.*, 31, p. 319] and their identifica-

tion. Leaves of plants carrying the former virus may be symptomless or bear a pale green or yellow interveinal mottle, which increases to a streak in severe cases. Flowers are striped with darker colours. The latter virus causes white blotching of the flower. The pea mosaic strain was transmissible by sap inoculation to French bean (*Phaseolus vulgaris*).

Costa (A. S.) & Bennett (C. W.). **A probable vector of Abutilon mosaic on species of Sida in Florida.**—*Plant Dis. Reptr*, 37, 2, pp. 92–93, 1953. [Multilithed.]

A disease similar to that described by Kunkel [*R.A.M.*, 9, p. 385], producing a conspicuous yellow mottle on species of *Sida* and probably identical with *Abutilon* mosaic [*A.* variegation] virus [ibid., 27, p. 566], was observed in the vicinity of Orlando and in other parts of Florida in 1946, 1947, and 1952. It is tentatively assumed that the virus is spread under natural conditions by the white fly, *Bemisia tabaci* [ibid., 26, p. 547], which was found on both healthy and diseased *Sida* plants. The occurrence of this vector in Florida is very significant as it transmits a number of other virus diseases so far not known to occur in the United States, thus allowing their possible establishment there if introduced.

McLachlan (K. D.). **The occurrence of sulphur deficiency on a soil of adequate phosphorus status.**—*Aust. J. agric. Res.*, 3, 2, pp. 125–127, 1 pl., 1952.

In field and pot-culture experiments at Cooma, New South Wales, subterranean clover (*Trifolium subterraneum*) grown on a local basaltic soil responded markedly to treatment with sulphate. The results clearly indicated that growth had been limited only by sulphur deficiency [see next abstract], the phosphorus content [*R.A.M.*, 32, p. 235] being high enough to promote maximum growth.

Millikan (C. R.). **Subterranean Clover symptoms of nutritional disorders.**—*J. Dep. Agric. Vict.*, 51, 5, pp. 215–225, 4 col. pl., 19 figs., 1953.

This is a well-illustrated account of nutritional deficiency symptoms exhibited by different varieties of subterranean clover (*Trifolium subterraneum*) [*R.A.M.*, 28, p. 218], produced in water-culture experiments at the Plant Research Laboratory, Burnley, Victoria. Diseases due to the deficiency of single elements, such as manganese, zinc [ibid., 30, p. 164], copper [loc. cit.], calcium, potassium, nitrogen, magnesium, iron, phosphorus, molybdenum [ibid., 31, p. 436, and next abstract], sulphur [see preceding abstract], and boron are described, as well as symptoms of multiple deficiencies, and those caused by excess manganese. Varietal differences in symptom expression between the Dwalgnup, Mt. Barker, Bacchus Marsh, and Costerton varieties are also pointed out.

Anderson (A. J.) & Moye (D. V.). **Lime and molybdenum in Clover development on acid soils.**—*Aust. J. agric. Res.*, 3, 2, pp. 95–110, 3 pl., 2 graphs, 1952.

In a study at the Division of Plant Industry, Canberra, Australia, of the factors concerned in the effect of lime on subterranean clover (*Trifolium subterraneum*) on an acid soil where nodulation is defective it was ascertained that responses equal to those obtained with heavy dressings of lime can be secured by applying molybdenum [see preceding abstract] together with 2 cwt. of lime per acre at seeding.

Graham (J. H.). **Reaction of strains of Red Clover to Stemphylium sarcinaeforme.**—*Plant Dis. Reptr*, 37, 2, pp. 95–96, 1953. [Multilithed.]

At the United States Regional Pasture Research Laboratory, State College, Pennsylvania, 27 strains of red clover from various parts of the United States, Canada, and Europe were screened for possible sources of resistance to leaf spot (*Stemphylium sarciniforme*) [*R.A.M.*, 28, p. 402]. Seedlings were sprayed with a

spore and mycelial suspension obtained from a mixture of isolates from central Pennsylvania, and then kept in a moist chamber for 48 to 72 hours at 20° to 25° C. A rating system of 0 (free from disease) to 10 (all leaves killed) was used. A wide range of susceptibility (2·8 to 8·8) was found but none of the strains tested was highly resistant. Wilson, Craig, and Pennscott from Pennsylvania and Kenland from Kentucky were relatively resistant, but it is believed that clones with greater resistance could be isolated from locally adapted varieties.

Menzies (J. D.). **Methods for reducing the spread of the witch's broom disease in Alfalfa.**—*Phytopathology*, 42, 12, pp. 649–650, 1952.

Lucerne witches' broom virus spreads more rapidly in small, thin stands than in larger, dense plantings [cf. *R.A.M.*, 29, p. 10]. From observations in the Methow Valley of Washington [ibid., 30, p. 471] it appears that the normally slow spread of infection into new plantings may be effectively prevented by the area-wide removal of old, diseased fields, followed by re-seeding and the maintenance of dense, productive stands through rational cultural practices.

'Synthetic' Alfalfa.—*Seed World*, 72, 12, p. 35, 1953.

Nevada Syn—A, a synthetic strain of lucerne developed from a combination of several strains and resistant to bacterial wilt [*Corynebacterium insidiosum*: *R.A.M.*, 31, p. 387; 32, p. 434 and next abstract], is now under co-operative test at Nevada Agricultural Experiment Station.

Lahontan Alfalfa shows promise in Nevada.—*Seed World*, 72, 12, p. 35, 1953.

Lahontan, a new lucerne variety now under experiment at Nevada Agricultural Experiment Station, has shown resistance to bacterial wilt [*Corynebacterium insidiosum*: see preceding abstract].

Horn (N. L.). **A comparative study of two species of Colletotrichum on Vetch.**—*Phytopathology*, 42, 12, pp. 670–674, 1 fig., 1952.

Anthracnose of vetch in Louisiana was found to be caused by two species of *Colletotrichum*, *C. villosum* [*R.A.M.*, 25, p. 216; 30, p. 599] and *C. sativum* n.sp., neither of which appears to be seed-borne. *C. sativum* produces on the leaves, stems, and pods circular to linear or irregular, light brown to grey spots with a narrow, garnet brown to warm sepia border. On the stem, lesions turn dark brown to black and the acervuli measure 55 to 125 μ in diameter and are sometimes provided with numerous 5-septate setae, Brussels brown and bulbous at the base, paling to light brown or grey at the tip, 60 to 200 by 6·5 to 9·3 (average 126 by 7·1) μ. The conidia are hyaline (ochraceous buff to grey in the mass), mainly straight, bluntly tapered, unicellular, 17 to 26 by 3·7 to 5·6 (average 21·2 by 3·8) μ, the most common size being 22·2 by 3·7 μ.

C. sativum caused severe damage when inoculated to *Vicia sativa*, *V. dasycarpa*, *V. alba*, *V. angustifolia*, *V. pannonica*, *V. grandiflora*, *V. articulata*, *V. hirsuta*, *V. aurantia*, garden, field, and sweet peas, and *Lathyrus hirsutus*, while *V. benghalensis*, *V. ludoviciana*, and *V. villosa* were resistant. *C. villosum* was pathogenic to *V. benghalensis*, *V. villosa* [see above, p. 543], *V. dasycarpa*, *V. ludoviciana*, and *V. articulata*, but caused little injury to the other *V.* spp. or to peas. *Melilotus indica* was attacked by *C. sativum* but not by *C. villosum*.

Smith (J. D.). **Fungi and turf diseases.**—*J. Sports Turf Res. Inst.* (formerly *J. Bd Greenkeep. Res.*), 8, 27, pp. 60–66, 1951; 28, pp. 144–149, 6 figs., 1952.

This series of popular articles is designed to explain the relationship between fungi and diseases of plants used in the production of sports turf. The first instal-

ment comprises an introduction to the biology of fungi and the second deals with methods of infection, colonization, and reproduction and dissemination with reference to specific diseases, and the mechanism of resistance and susceptibility.

Grasso (V.). **Le Claviceps delle Graminacee italiane. Parti III, IV, e V.** [*Claviceps* on Italian Gramineae. Parts III, IV, and V.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1173–1203; 6, pp. 1507–1520, 1521–1553, 3 pl., 1 fig., 30 graphs, 1952. [English summaries.]

In the third paper of this series [cf. *R.A.M.*, 32, p. 258] the author presents a statistical elaboration of the measurements of the conidia of *Claviceps* spp. from 46 hosts and of the sclerotia, capitula stalks, capitula, perithecia, asci, and ascospores from 20 hosts.

In the fourth paper he discusses various instances of the regeneration of beheaded stalks of *Claviceps* spp. [ibid., 30, p. 474] and abnormalities in the germination of sclerotia. The influence of light on the growth and shape of the capitula and that of gravity on the shape of the sclerotia are examined. The partial ergotization of wheat kernels is described.

In the final part he concludes by stating that hosts of the *Agropyron cristatum*—wheat group are attacked by *Claviceps purpurea* [cf. ibid., 31, p. 379], with which *C. microcephala* [cf. ibid., 29, p. 567], *C. sesleriae* [loc. cit.], and *C. setulosa* are considered synonymous. This was confirmed by inoculation experiments. *Paspalum dilatatum* and *P. distichum* are attacked by *C. paspali* [cf. loc. cit.]. As the perfect state of *Sphacelia juncicola*, *C. junci* Adams, has never been found the author suggests that the former name should be used.

The measurements of the different organs of the species dealt with are tabulated, and the geographical distribution is given. The bibliography comprises 167 references.

Andrew (C. S.), Kipps (E. H.), & Barford (Helen). **Plant responses to nitrogen and sulphur on a heavy clay soil from the Darling Downs, south-east Queensland.**—*Aust. J. agric. Res.*, 3, 2, pp. 111–124, 1 pl., 1952.

Investigations were conducted at the Division of Plant Industry, Brisbane, Australia, to throw light on the nutritional aspect of the failure to establish the pasture grass *Paspalum scrobiculatum* var. *commersonii* on the heavy black clay soil of the Brookstead area of the Darling Downs, Queensland. In the field the affected plants incline towards a rosette habit and the leaves are broader than normal, with chlorotic areas. Chlorosis is confined to the lower part of the blade and may appear as transverse banding up to $\frac{3}{4}$ in. wide or as longitudinal interveinal streaking. Marginal constriction is often associated with banding, and the leaf may kink, the distal end dying off.

Pot-culture experiments with *P. scrobiculatum* var. *commersonii* and *Setaria italica* established that insufficient nitrogen and sulphur were responsible, while additional zinc (spray or soil application) reduced the chlorotic symptoms and increased yield. It would appear that the chlorotic condition is indicative of the unavailability of zinc in the soil. Ammonium sulphate, in addition to assuring adequate supplies of nitrogen and sulphur, modifies the pH and increases the availability of trace elements. For legumes alone (*Phaseolus lathyroides* in these experiments) addition of sulphur or certain sulphates should suffice to promote vigorous growth.

Holton (C. S.). **Tilletia elymi, an apparently homothallic species.**—*Phytopathology*, 42, 11, pp. 635–636, 1952.

At Washington Agricultural Experiment Station, Pullman, chlamydospores of *Tilletia elymi* from *Elymus glaucus* germinated over a period of several weeks on

2 to 3 per cent. water agar at 5° C. The promycelia bore three to five primary sporidia ranging from 60 to 85 μ in length and 2·5 to 3 μ in diameter; from their rigidity the protoplasmic content appears to be highly turgid in contrast to the known heterothallic species, which have comparatively slender and very flexible sporidia. On germination of the primary sporidia the protoplasm is concentrated in a relatively long apical cell, and as development continues a long, empty cellular strand results. A comparable mode of growth was observed in the germ-tubes of fused pairs of primary sporidia of the heterothallic *T. caries* and *T. foetida* [*R.A.M.*, 21, p. 190]. Only one primary sporidium of *T. elymi* developed a mycelial colony in culture, but a few fairly large, falcate secondary sporidia were formed on the agar among germinating spores and grew in the same way as the primary.

Indications of homothallism in *T. elymi* are provided by the relatively small number of primary sporidia, their morphological characters, the absence of fusion between them, their mode of growth in culture, and the multinucleate condition of both primary and secondary sporidia, but positive evidence from pathogenicity is still lacking.

Graham (J. H.). **Purple leafspot of Orchard Grass.**—*Phytopathology*, 42, 12, pp. 653–656, 1 graph, 1952.

The essential information in this expanded account of the author's studies on purple leaf spot (*Stagonospora maculata*) of *Dactylis glomerata* at the U.S. Regional Pasture Research Laboratory, State College, Pennsylvania, has already been noticed from a preliminary communication [*R.A.M.*, 32, p. 385].

Darpoux (H.). **Les 'blancs' des arbres fruitiers.** [The mildews of fruit trees.]—*Jardins de Fr.*, Sér. VII, 7, 5, pp. 128–138, 3 figs., 1953.

Brief, popular notes are given on the symptoms, causes, and control of the mildews of apple (*Podosphaera leucotricha*) [*R.A.M.*, 31, p. 612, *et passim*], peach (*Sphaerotheca pannosa* var. *persicae*) [cf. ibid., 8, p. 655; 30, pp. 202, 600; 31, p. 354, *et passim*], and apricot (*P. oxyacanthae* var. *tridactyla*) [ibid., 5, p. 699; 28, p. 6]. The apple varieties Canada Gris and Reinette Baumann are only very slightly susceptible to *P. leucotricha* [ibid., 28, p. 461; 30, p. 276].

Scott (W. J.). **Mould wastage in stored fruit.**—*Food Pres. Quart.*, 12, 3–4, pp. 21–25, 1952. [Abs. in *Abstr. Publ. Pap. & List Transl.*, 1, 6, p. 4, 1953.]

A brief review is given of control measures against moulds such as *Penicillium expansum*, *P. digitatum*, and *Rhizopus* and *Sclerotinia* spp. occurring on stored fruit [*R.A.M.*, 31, p. 66] and host resistance in relation to the factors affecting pathogenicity, namely storage temperature, composition and humidity of the storage atmosphere, species and maturity of the fruit, and the fungi involved.

Stanković (D.). Активирање зарашћивања пресека грана воћака помоћу фитохормоналних стимулуса. [Promotion of wound-healing of fruit trees by means of phytohormonal stimulants.]—Год. пољоп. Фак., Београд [*Yearb. Fac. Agric., Beograd*], *1952*, 4, pp. 205–211, 1 pl., 1952. [English summary.]

The results of studies carried out in Yugoslavia on the healing effect of certain wound dressings [cf. *R.A.M.*, 30, p. 206; 32, p. 435] on pruning wounds of apple, pear, cherry, plum, and walnut trees indicate that the formation of callus depends largely on the condition, vitality, and age of the trees and on the manner of pruning. Young healthy trees with wounds caused by complete removal of branches healed better and more rapidly than older trees. The three dressings tested, namely, grafting wax, Roche 202 (1 part growth promoting compound in

100 parts water added to 100 parts grafting wax), and 'rooton' (1 part to 100 grafting wax), all caused more rapid and better healing than no treatment.

CROWDY (S. H.). **Observations on Apple canker. IV. The infection of leaf scars.**—*Ann. appl. Biol.*, 39, 4, pp. 569–580, 1 pl., 3 graphs, 1952.

Field observations on the infection of leaf scars by apple canker (*Nectria galligena*) [cf. *R.A.M.*, 29, p. 262] confirmed the importance of the disease in south-western England and demonstrated that on a severely infected tree over 50 per cent. of the current year's growth may be affected. Freshly exposed leaf scars may become infected by spores sucked into the tracheids, where they develop in a relatively protected environment. The susceptibility of such scars is considerably less after about one hour.

The infections may develop into cankers at once or they may be confined by a suberized or gum barrier. Mycelium from some of these confined lesions may grow into the surrounding tissue through growth cracks when the buds develop. The lesions are present throughout winter and spring, and as a rule the scars inoculated first are the first to produce cankers.

Applications of protective fungicides are unlikely to prove effective, but experiments with eradicant fungicides have demonstrated that phenyl mercury chloride can be safely applied before leaf fall at concentrations which will prevent the sporulation of cankers for long periods [see next abstract]. It would, therefore, appear to be possible to suppress sporulation during the critical period for infection. In an established orchard the patchy distribution of the disease might make a general spray unnecessary, effective control probably being possible by the removal of cankers and cankered shoots, but in the nursery or new plantings, where it is necessary to avoid cankers on shoots which will form the framework of the tree, a general prophylactic treatment may be desirable.

BYRDE (R. J. W.), CROWDY (S. H.), & ROACH (F. A.). **Observations on Apple canker. V. Eradicant spraying and canker control.**—*Ann. appl. Biol.*, 39, 4, pp. 581–587, 1952.

In tests on inoculated trees at Long Ashton Research Station and in a badly infected Gloucestershire orchard with eradicant sprays against apple canker (*Nectria galligena*) [see preceding and next abstracts] sodium pentachlorophenate and phenyl mercury chloride both checked sporulation on leaf-scar cankers, the latter product proving the more effective and reducing sporing for 18 months after application. Established leaf-scar cankers were unaffected by the treatments, though the incidence of leaf-scar infection was lowered by sprays and by the removal of affected material from the tree. The results of spraying with phenyl mercury chloride were comparable to those obtained by cutting out diseased material and were much superior to the effects of protectant copper sprays.

The critical period for leaf-scar infections during the experiments was in the spring, but a phenyl mercury chloride spray applied early enough to be effective on leaf-fall infections reduced spring infections as effectively as one applied later. This further supports the view that the early spray inhibits spore production throughout the winter and thus reduces the infection of pruning wounds and leaf scars.

While a routine pre-leaf-fall spray would probably do much to protect trees in nurseries and young plantings from a serious outbreak, eradicant spraying alone would be unlikely to rejuvenate an old and cankered orchard. The treatment might prevent fresh infections, but the existing cankers would retain living mycelium which might eventually kill the infected branches. Spraying should be supplemented by the excision of cankers.

Moore (M. H.) & Bennett (Margery). **Scab, canker, and branch blister of Apple at East Malling in relation to nutritional treatment of the host.**—*Ann. appl. Biol.*, 39, 4, pp. 588–598, 1952.

During a period of 11 years at East Malling moderate annual dressings of ammonium and potassium sulphate had no consistent effect on the incidence of scab (*Venturia inaequalis*) [*R.A.M.*, 15, p. 588; 17, p. 826] on established trees of four different apple varieties on M. IX rootstock. Similarly, such dressings, continued over five seasons, appeared to have no effect on the incidence of apple canker (*Nectria galligena*) [ibid., 27, p. 75 and preceding abstracts] on a row of M. VIII stocks grown under conditions favouring infection. A feature which gave point to the distinction between liability and susceptibility to infection was that the M. VIII stocks though susceptible remained uninfected for three years until inoculum was provided by tying-in fertile cankers, whereupon they rapidly succumbed, whereas susceptible trees in a neglected plantation are particularly liable to infection because of past neglect in removing old cankers. Therefore, the management factor must be considered before observed numerical differences in canker between plantations can be ascribed to differences in nutrition.

The incidence of branch blister, a functional disorder associated with but not caused by *Coniothecium chomatosporum* [ibid., 18, p. 461], was greatly reduced in Cox's Orange Pippin by potassium manuring, and was also influenced by the rootstock, a vigorous one reducing incidence.

Heuberger (J. W.) & Poulos (P. L.). **Control of fire blight and frog-eye leaf spot (black rot) diseases of Apples in Delaware in 1952.**—*Plant Dis. Reptr*, 37, 2, pp. 81–83, 1953. [Multilithed.]

In a spray trial for the control of apple fire blight (*Erwinia amylovora*) [*R.A.M.*, 32, p. 83] and black rot (*Physalospora obtusa*) [ibid., 32, p. 321] carried out under epiphytotic conditions on the Starr variety at Bridgeville, Delaware, in 1952, a preliminary report on which has already been noticed [loc. cit.], dithane Z-78, parzate, and manzate (all at 2 lb. in 100 gals. water) were highly effective against both diseases, the percentages of fire blight being 15, 7, and 13, respectively, compared with 32 for the untreated, and of black rot 17, 14, and 25, respectively, as against 62. Thiolutin [ibid., 32, p. 441] (120 p.p.m.) allowed 16 per cent. fire blight and 35 per cent. black rot; streptomycin sulphate at the same concentration reduced fire blight to 15 per cent.

Lewis (G. D.) & Shay (J. R.). **Control of summer diseases of Apple.**—*Plant Dis. Reptr*, 37, 2, pp. 84–87, 2 figs., 1953. [Multilithed.]

During the 1952 spray trials in southern Indiana some success was obtained in the control of summer diseases on Golden Delicious apples without adverse effects on fruit finish. At Nashville, 50 per cent. orthocide 406 at 2 lb. per 100 gals. water for the pink bud and calyx sprays and 1 lb. for the eight cover sprays reduced black pox (*Helminthosporium papulosum*) [*R.A.M.*, 14, p. 372] from 99·2 to 6·5 per cent., completely controlled flyspeck (*Leptothyrium pomi*) [ibid., 30, p. 52] and sooty blotch (*Gloeodes pomigena*) [ibid., 29, p. 569], and gave the best finish. Omission of the pink bud and calyx applications resulted in 63·4 per cent. russet as against 17·3 per cent. for the full schedule of orthocide 406.

Of the four fungicides tested against *Botryosphaeria ribis* [ibid., 15, p. 514] at Vincennes, only orthocide 406 significantly reduced the percentage of post-harvest rotting.

Byrde (R. J. W.). **Experiments on the control of brown rot of Apples and Plums. III. Summer spraying trials.**—*J. hort. Sci.*, 27, 4, pp. 237–244, 2 pl., 1952.

In further spraying tests [*R.A.M.*, 32, p. 321] at Long Ashton Research Station,

University of Bristol, in July, 1950, applications of three organic fungicides, phenyl mercury chloride [loc. cit.; ibid., 29, p. 102], dichloronaphthoquinone [ibid., 31, p. 290], and N-trichloromethylthio-tetrahydrophthalimide [ibid., 32, p. 85], gave no significant control of plum brown rot (*Sclerotinia fructigena* and *S. laxa*). The addition to the sprays of too high a concentration of wetter and the fact that heavy rain fell after spraying may have contributed to the failure to reduce infection.

Two summer applications of 0·05 per cent. 2:3-dichloro-1:4-naphthoquinone each at the rate of 3½ to 4 gals. per tree to Laxton's Superb apples substantially reduced a relatively light attack of brown rot (*S. fructigena*), the estimated brown rot loss amounting to only 0·2 per cent., as against 5·4 per cent. for the unsprayed and 6·2 per cent. for the corresponding treatment with 0·005 per cent. phenyl mercury chloride [cf. above, p. 567]. Both materials were phytotoxic, especially to plums.

In estimating the amount of infection the usual method of expressing it as a proportion of the total fruits sampled was modified to give a statistically reliable method, because undamaged fruits are almost immune from primary infection; the number of uninfected fruits with skin damage was included and primary and contact infections were recorded separately. From these and other detailed recordings (number of applications of each material, and proportion of damaged fruits infected) tree-to-tree variability was calculated by the original and modified methods. In the latter the total number of injured fruits was considered to be the sum of the number of injured healthy fruits and the number of fruits having primary infections, as it may be assumed that such infections developed at injuries. The results obtained indicated that the modified technique gave a marked decrease in tree-to-tree variability of data.

Govi (G.). **Un marciume di frutti immagazzinati (Phacidiopycnis furfuracea (Rostr.) Jørst.).** [A rot of stored fruits (*Phacidiopycnis furfuracea* (Rostr.) Jørst.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1121–1129, 7 figs., 1952. [English summary.]

Passacrassana pears placed in cold storage near Bologna during the winter of 1950–51 developed large, soft brown lesions about 3 cm. deep. The epidermis remained unbroken but at certain points black wrinkles appeared, bearing masses of pycnidia. The flesh was brown and flaccid, and the cells were invaded by mycelium.

In culture the fungus formed cirrhi of whitish, unicellular, hyaline, oval or pyriform microconidia, 2·3 to 4·7 μ in size. Later, the cirrhi sometimes became yellowish and of a waxy consistency. The mature conidia were round or oval, unicellular, hyaline, and had two walls, of which the outer was the more conspicuous; they measured 9 to 15 (11) by 7·5 μ. In conditions unfavourable to germination the conidia were transformed into organs resembling round chlamydospores 11 to 19 μ in diameter, bearing as appendages the remains of the two conidial walls. The fungus was compared with a culture of *Phacidiella discolor* [*R.A.M.*, 25, p. 185] from Baarn and was considered to be identical with *Phacidiopycnis furfuracea* [loc. cit.], with which *Cytosporella fructorum* [ibid., 6, p. 236] is considered synonymous. Inoculations of healthy apple, pear, and quince fruits with *P. furfuracea* gave positive results.

Refatti (E.) & Lepori (L.). **Ticchiolatura tardiva di magazzino su frutti di Pero.** [Late scab on Pears in storage.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1217–1234, 7 figs., 1952. [English summary.]

During the last few years, particularly at the end of November, 1950, Curato pears in storage in the Trentino area, Italy, have developed severe damage due to

infection by *Fusicladium pirinum* [*Venturia pirina*: cf. *R.A.M.*, 26, p. 306; 30, p. 275]. Rotting set in. A study of the meteorological data indicated that initial infection had probably occurred shortly before picking, and this could be remedied by the application of a fungicidal spray late in the season. The fruit should be picked only when quite dry.

GOIDÀNICH (G.). **Le 'macchie rosse' del Pesco.** ['Red spots' on Peach trees.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1267–1270, 1 col. pl., 1952. [English summary.]

In the summer of 1950 a planting of one-year-old wild peach trees near Bologna developed a diffuse leaf spotting apparently identical with that reported from Bulgaria by Atanasoff as a mosaic probably due to a virus [*R.A.M.*, 14, p. 367]. The spots were chlorotic-translucent, progressively shading off in colour at the periphery, up to 1 cm. in diameter, and irregularly scattered over the surface of leaves on all parts of the plant. Later, they turned red-purple and became necrotic at the centre and circumference where the necrosis tended to form a more or less complete circle. The borders of the spots became lacerated in places, but as a rule no portion fell out. The leaves on the middle of the tree fell prematurely, some appreciable time before those on the other parts.

The same trees and in many cases the same branches displayed another leaf abnormality, apparently unrelated to that described above. The lowest adult leaves developed irregular whitish-yellow lines, sometimes forming a ring, over the whole leaf surface. This symptom was present during the entire life of the leaf.

Grafting experiments have not yet given any positive results.

GOIDÀNICH (G.), BRANZANTI (E. C.), & TOGLIANI (F.). **Osservazioni sul mal del piombo del Pesco in Emilia ed in Romagna.** [Observations on silver leaf disease of Peach trees in Emilia and Romagna.]—*Riv. Fruttic.*, 14, 1, pp. 7–19, 1952. [Abs. in *Biol. Abstr.*, 27, 1, p. 231, 1953.]

Artificial inoculation experiments at the Institute of Plant Pathology, Bologna, Italy, with *Stereum* [*purpureum: R.A.M.*, 17, p. 727] showed that longitudinal spread in peach trees is very rapid. Alterations are apparent primarily in the innermost wood elements, but the mycelium occurs chiefly in the peripheral xylem. Leaves of new branches show the symptoms of the disease, but the woody tissues are unaffected and the fungus cannot be isolated from them. When diseased scions and buds are grafted to healthy stock the latter remains unaffected. At certain points dark red, gummy substances appear to block further spread of the fungus [cf. ibid., 32, p. 134]. The vessels gradually close and the wood parenchyma turns brown.

CARDINELL (H. A.). **Some effects of brushing and sulfur dusting of Peaches on decay and shriveling.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 35, 1, pp. 34–38, 2 figs., 1952.

In 1949 experiments were carried out conjointly by the Coloma Fruit Exchange, Coloma, Michigan, the National Association of Ice Industries, Inc., Washington, D.C., and the Food Machinery and Chemical Corporation, Lansing, Michigan, to evaluate the effects of brushing and dusting peaches on [unspecified] decay and shrivelling [see next abstract]. The fruit came from a single orchard and was treated within 14 hours of picking. It was either (1) brushed, (2) brushed and dusted with sulphur, or (3) neither brushed nor dusted, in each case either without further treatment or followed by 'stericooling' with sodium hypochlorite at 1,530 p.p.m. available chlorine in 32° F. ice-water for 30 minutes [*R.A.M.*, 27, p. 570]. The peaches were then placed for 12 days at 75° to 85° to ripen and hasten the effects of treatment. The percentage decay was reduced by all the treatments.

Brushing plus 'stericooling' was the most effective, resulting in 10·55 per cent. decay compared with 48·2 per cent. for the untreated and unbrushed. Brushing greatly increased the severity of shrivelling, the highest percentage being among fruit given sulphur treatment as well. 'Stericooling' was less effective in reducing decay and shrivelling of brushed, dusted fruit than of that brushed only.

Cardinell (H. A.) & Barr (C. G.). **Post harvest tests with Peaches to reduce spoilage.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 35, 1, pp. 39–51, 3 figs., 1952.

During experiments carried out in Michigan in 1949 on the control of [unspecified] post-harvest decay of Elberta peaches [see preceding abstract], using fruit from one orchard, the time lapse between picking and treatment, peach maturity, and the place of entrance of the decay organisms as related to the treatment [*R.A.M.*, 27, p. 570] were examined. The results indicated that refrigeration at 32° F., even for 18 to 29 hours after harvest, inhibited subsequent decay. All treatments made within three hours of picking were promising, sulphur dust, 8-quinolinoline (0·02 per cent.), and sodium hypochlorite (200 p.p.m.) being best (1·86, 2·72, and 3·55 per cent. decay, respectively, compared with 28·44 per cent. for the untreated). Peaches harvested at the green 'hard-ripe' stage were most suitable for shipment or cold storage. Those at the 'firm-ripe' to 'ripe' stage should be treated with one of the more effective fungicides and then held under refrigeration; dusting with sulphur and 'stericooling' with sodium hypochlorite (1,000 p.p.m.) resulted in 6·15 and 8·08 per cent. decay, respectively, as against 48·61 per cent. for the untreated.

Healy (W. B.). **Treatment of lime-induced manganese deficiency in Peach trees.**—*N.Z. J. Sci. Tech.*, Sect A, 34, 5, pp. 386–396, 1953.

Soil investigations were carried out at the Soil Bureau, Wellington, New Zealand, to determine the factors responsible for the manganese deficiency which caused severe chlorosis of peach trees [*R.A.M.*, 25, p. 2; cf. next abstract] in the Hawke's Bay district in 1947–8. Manganese sulphate sprays (0·2 and 0·3 per cent., the latter plus a wetting agent, agral L) and solid injections (6 gm. per tree) both successfully prevented deficiency symptoms, solid injections increasing manganese content of the leaves also. Sprays, however, and manganese sulphate applications to the roots (partially successful) were effective for one season only.

Bollard (E. G.). **Manganese deficiency of Apricots.**—*N.Z. J. Sci. Tech.*, Sect. A, 34, 5, pp. 471–472, 1 fig., 1953.

Leaf chlorosis, caused by manganese deficiency [see preceding abstract], has been observed on apricots [cf. *R.A.M.*, 31, p. 438] in Central Otago and Roxburgh, New Zealand. Studies at the Fruit Research Station, Auckland, have shown that obvious chlorotic symptoms, which are more pronounced on older than on younger leaves, may not appear until January. Interveinal chlorosis is very common, though sometimes only the margins are affected, while in severe cases only the veins remain green. Of all the treatments tested the only one which completely checked chlorosis and produced leaves of a darker green than on untreated trees was two leaf sprays (one would probably be sufficient) of manganese sulphate (3 lb.) plus hydrated lime (4 lb.) in 50 gals. water. To avoid a black deposit on the fruits spraying as soon as the new shoots have made about an inch of growth might be advisable.

Albert (A. R.). **Potassium cures Cherry curl leaf.**—*Bett. Crops*, 4 pp., 4 figs., 1950.

In studies at the Soils Department, University of Wisconsin, Madison, on the control of sour cherry curl leaf, the cause of which is unknown, 0–9–27 fertilizer

(3 to 6 lb. for small trees and 5 to 20 lb. for large), applied under and somewhat beyond the branches and followed by a mulch, was effective in carrying trees into production. Where no mulch is available the fertilizer application should be repeated after about two years. A maintenance treatment of 3 to 8 lb. fertilizer per tree every year or two is recommended as a preventive measure. When the available phosphorus content of the soil reaches 60 to 80 lb. per acre and the potassium 250 to 300 lb. the treatment should be modified.

[This paper also appeared in *Wis. Hort.*, 40, pp. 219–220, 1950.]

GALLUCCI (MARIA M.). **Un' infezione da Monilia fructigena Pers. su drupe di Prunus laurocerasus L.** [An attack of *Monilia fructigena* Pers. on drupes of *Prunus laurocerasus* L.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1399–1404, 1 pl., 1952. [English summary.]

An account is given of a study of brown rot of *Prunus laurocerasus* fruits caused by *Monilia* [*Sclerotinia*] *fructigena* near Turin. This is probably the first record of the fungus on this host in Europe.

FULTON (R. H.). **Verticillium wilt of Raspberries.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 35, 2, pp. 248–264, 3 figs., 1952.

The author gives a full account of the symptoms of *Verticillium* wilt (*V. albo-atrum*) on black and red raspberry in Michigan [*R.A.M.*, 31, p. 337], as determined by cane wound inoculation. The information on strains of the fungus has already been noticed [loc. cit.]. Some red raspberry suckers may be entirely free from infection. Crop rotations which include solanaceous plants should be avoided; this seems to be the principal source of infection in Berrien county.

OORT (A. J. P.). **Taksterfte bij Bramen veroorzaakt door Septocyta ramealis (Rob.) Pet.** [Die-back of Blackberry caused by *Septocyta ramealis* (Rob.) Pet.]—*Tijdschr. PlZiekt.*, 58, 6, pp. 247–250, 1 pl., 1 graph, 1952. [English summary.]

In a garden in the Bommelerwaard province of Gelderland, Holland, the stems of blackberries under observation since the autumn of 1950 on account of a severe die-back were covered on 19th March, 1952, with dark purplish-brown spots containing numerous pycnidia of *Rhabdospora ramealis* (syn. *Septocyta ramealis*) [*R.A.M.*, 31, p. 561]. The disease was of little importance in 1952. In spore-trapping experiments pycnidiospores were caught daily from the beginning of April until the end of August with a sharp peak of over 4,000 per sq. cm. daily at the end of June and beginning of July. No spores were trapped in dry weather, neither were any new infections observed on young branches throughout the summer up to the last inspection on 10th September; on 23rd October the first lesions were detected, mostly on the lower parts of the shoots. Inoculated plants kept for six weeks under illumination at 4° C. showed die-back symptoms a week after their removal, while others inoculated at the same time and held in a greenhouse at room temperature remained healthy.

Control of the disease consists mainly in the protective applications of copper or carbamate sprays to the young growth until immediately before picking at the end of July. The tips of old branches, which are often covered with spots, should be removed in early spring to prevent infection of the young shoots arising from them.

Blackberries in another garden sustained heavy damage from a die-back attributed to *Didymella applanata*.

MILLER (P. W.). **Aphid Myzus solani does not transmit Strawberry yellows virus complex.**—*Plant Dis. Reptr*, 37, 2, p. 89, 1953. [Multilithed.]

In tests at the Oregon Agricultural Experiment Station, Corvallis, a colony of

Myzus [*Aulacorthum*] *solani*, which has often been found on both wild and cultivated strawberries in the field, was maintained for ten days on Marshall plants infected with the strawberry yellows virus complex [*R.A.M.*, 32, pp. 262, 490]. Five aphids were then transferred to each of 20 healthy *Fragaria vesca* plants and allowed to feed for five days. Since none of these plants became infected it is concluded that *A. solani* is not a vector of the virus complex.

Marcus (C. P.) & Miller (P. W.). **Summary of the search for virus-free plants of Strawberry varieties.**—*Plant Dis. Reptr*, 37, 2, pp. 90–91, 1953. [Multilithed.]

This is a progress report of the results of a search made for virus-free strawberry stocks in the United States [cf. *R.A.M.*, 31, p. 288]. During 1952 virus-free plants [ibid., 32, p. 262] of five or six varieties were obtained at Beltsville, Maryland, and six more in Oregon, making a total of 40 varieties of which healthy stocks are available, i.e., varieties comprising 96 per cent. of the strawberry acreage in the United States. Climax and Royal Sovereign, imported from Great Britain, also proved virus free.

Prentice (I. W.). **Resolution of Strawberry virus complexes. V. Experiments with viruses 4 and 5.**—*Ann. appl. Biol.*, 39, 4, pp. 487–494, 1952.

Further work on the resolution of strawberry virus complexes [cf. *R.A.M.*, 31, p. 246] at East Malling Research Station, Kent, revealed the presence of two further strains, 4 and 5. Virus 4 is graft-transmissible and produces vein chlorosis and necrosis on Royal Sovereign strawberry and slight chlorotic spotting on wild strawberry (*Fragaria vesca*) [cf. ibid., 27, p. 571]. No insect vector has been found. Virus 5 produces leaf curl and vein necrosis on Royal Sovereign and *F. vesca*. It is transmitted by *Pentatrichopus fragaefolii* after feeding on an infected plant for at least one hour, and persists for about one hour in the vector.

The names proposed for the five viruses studied are: virus 1, strawberry mottle virus; virus 2, strawberry mild yellow-edge virus; virus 3, strawberry crinkle virus; virus 4, strawberry vein chlorosis virus; and virus 5, strawberry leaf-curl virus. Virus 2 is probably a mixture of strains, and further work may make it necessary to rename this virus. So far as is known strawberry leaf-curl virus does not occur in the field in Great Britain. The symptoms superficially resemble those of strawberry leaf roll [ibid., 21, p. 533], but the two viruses are probably distinct, and further work is required to decide the question.

Crosse (J. E.) & Pitcher (R. S.). **Studies in the relationship of eelworms and bacteria to certain plant diseases. I. The etiology of Strawberry cauliflower disease.**—*Ann. appl. Biol.*, 39, 4, pp. 475–486, 1 pl., 1952.

In studies at East Malling Research Station, Kent, on strawberry cauliflower disease, previously believed to be associated with *Corynebacterium fascians* [cf. *R.A.M.*, 30, p. 332] and also with the eelworms *Aphelenchoides ritzema-bosi* and *A. fragariae*, together or separately, typical symptoms were reproduced only by a combination of *A. ritzema-bosi* and strains of *C. fascians* isolated from affected strawberries. Small alaminate leaves and leaf enations appeared whenever the eelworm was introduced, even when no bacteria were simultaneously inoculated, but subsequent isolations demonstrated the presence of contaminant strains of *C. fascians*. The severity of the enation symptom was related to the presence of a particular strain of the bacterium, though this correlation did not hold for the alaminate leaves.

In parallel field investigations it was established that eelworm-infested strawberries free from cauliflower symptoms often bore alaminate leaves, with which *C. fascians* was consistently associated. The suggestion is made, therefore, that

'cauliflower' is merely the least frequent of a range of symptoms presented by a bacterial disease endemic in strawberry plants infested with *Aphelenchoides* spp.

Ciccarone (A.). **Osservazioni sulla 'gelatina' e su alcune gommosi del colletto e delle radici degli Olivi.** [Observations on 'jelly' and some gummoses of the collar and roots of Olive trees.]—*Boll. Staz. Pat. veg. Roma*, Ser. 3, 9 (*1951*), pp. 205–213, 4 figs., 1953. [English summary.]

Bark necrosis and gumming of the collar and main roots of olive trees [cf. *R.A.M.*, 28, p. 650] has been observed at Nerola, Lazio, Italy. The disorder, commonly termed 'jelly', is attributed to the poorness and excessive humidity of the soil in winter. Affected tissue is attacked by common soil-inhabiting fungi, such as *Phialophora* sp. and *Fusarium* spp., which give rise to wood rots. At present control is achieved by baring the roots, removing the infected bark, and limewashing the root system and exposing it to the sunlight throughout the summer. Similar symptoms have also been observed by the author in Lecce and Mesagna, Brindisi.

Perišić (M.). Прилог проучавању мозаика Смокве на црногорском приморју. [Contribution to the study of Fig mosaic virus on the Montenegrin coast.]—Год. пољоп. Фак., Београд. [*Yearb. Fac. Agric., Beograd*], *1952*, 4, pp. 229–234, 1 pl., 1952. [French summary.]

During a survey of fig trees along the Montenegrin coast in Yugoslavia in the summer of 1952 the following diseases were recorded: *Cercospora boleana* [*R.A.M.*, 26, p. 328], *Uredo* [*Cerotelium*] *fici* [loc. cit.; ibid., 30, p. 196; 31, p. 33], and fig mosaic virus [ibid., 31, p. 616] which was by far the most serious and most widespread. Of the 66 varieties tested for resistance to mosaic only Djonkula, Constantinople, Zimnica (Winter fig), Bujaka black, Sultania white, and Petrovača black were found to be free from the disease. The usual control measures are recommended, including the systematic examination and control of nursery planting material. Fig mosaic virus was also observed in Kaštel Stari near Split [loc. cit.].

Les traitements chimiques des hampes et la pourriture des régimes de Bananes. [Chemical treatments of the stalks and rotting of the bunches of Bananas.]—*Fruits d'outre mer*, 7, 8, pp. 380–384, 1952.

Co-operative experiments in Martinique and Guadeloupe demonstrated that preventive treatment of bananas against [unspecified] stalk rots [*R.A.M.*, 29, p. 35] by treating the cut ends of the bunches with a mixture of vaseline borate and methylene blue immediately before trimming and packing resulted in a marked improvement in their general condition on arrival at their destination and a reduction in drying of the cut stalks. The increase in rotting during ripening was considerably less in the treated lots than in the untreated. However, in no case was total protection obtained. Curative treatments applied after infection had occurred were ineffective. At present the best method of control appears to lie in the production of good quality fruit undamaged before transportation.

Waite (B. H.) & Dunlap (V. C.). **Preliminary host range studies with Fusarium oxysporum f. cubense.**—*Plant Dis. Reptr*, 37, 2, pp. 79–80, 1953. [Multilithed.]

In preliminary pot experiments at the Tropical Research Department, United Fruit Company, La Lima, Honduras, various weeds and grasses found growing in banana plantings were soil inoculated with *Fusarium oxysporum* f. *cubense* [*R.A.M.*, 32, pp. 135, 324] to find whether they could act as carriers of the fungus [ibid., 28, p. 189] to bananas in the field. After six weeks the fungus was isolated from surface-sterilized sections of *Paspalum fasciculatum*, *Panicum purpurascens*, *Ixophorus unisetus*, and *Commelina diffusa*. Field collections of these species from areas adjoining diseased banana mats also yielded the pathogen.

Linford (M. B.). **Pineapple diseases and pests in Mexico.**—*F.A.O. Plant Prot. Bull.*, 1, 2, pp. 21–25, 1952.

Observations of pineapple problems in Mexico in June and July, 1951, mostly in the area of major production round Loma Bonita, Oaxaca, are summarized. In the main canning area, near the borders of Vera Cruz and Oaxaca, bacterial fruitlet black or brown rot [? *Erwinia ananas*: *R.A.M.*, 19, p. 72; 30, p. 333], for which the author prefers the term 'marbled fruit' [cf. ibid., 19, p. 459], caused alarm in 1949 when 38 to 40 per cent. of the fruits became affected in one week in May, at the start of the canning season. Incidence then declined. In 1950 and again in 1951, 30 per cent. of the crop was affected for a short time. In all three years the disease was most prevalent on fruit that ripened early, only traces of infection remaining by late June or July. The disease appears to develop very rapidly, and only during ripening. There seem to be no records of it in Mexican fruits picked green and allowed to ripen during transit and marketing. The agricultural practice most likely to ameliorate the condition would appear to be the use of potassium fertilizers, as these are likely to increase fruit acidity and it is known the condition is most prevalent in areas where fruit acidity is low.

Plants affected by terminal mottle were seen in the Loma Bonita area. The nature of this disease, which has been present in Hawaii since 1935, is as yet imperfectly known. Plant vigour is diminished and a wilt-like mottling with collapse of the leaf tips occurs mostly when the plants are 10 to 14 months old, but before the fruits ripen. The leaf tips become red or yellowish with an irregular green, yellow, and red mottle, they are thin and soft, and the margins recurve. Finally, the mottled tissues die. Affected plants may fruit tardily and may fail to produce a ratoon crop. The disease is perpetuated indefinitely by vegetative propagation, but the selection of vigorous planting material tends to eliminate the more severe strains.

Heart rot (*Phytophthora* sp.) was responsible for the death of many plants and replants in irregular areas in fields at Los Robles.

Cripple, a fruit deformity the cause of which has not yet been determined, was occasionally seen. Severe fasciation was present at Estación Isla and Los Robles. Cork spot and the slow fungus rots [unspecified] that spread from it were seen repeatedly in canneries, but did not appear to be important. Only a few examples of fruitlet core rots [cf. ibid., 17, p. 192] were noted. A few examples of glassy spoilage, the result of invasion of the ripening fruit by any one of several yeasts or yeast-like fungi producing little or no gas, were observed in canneries at Isla and Loma Bonita.

Martorell (L. F.) & Adsuar (J.). **Insects associated with Papaya virus disease in the Antilles and Florida.**—*J. Agric. Univ. P.R.*, 36, 4, pp. 319–329, 1952.

Most of this information on the viruses causing papaw bunchy top [*R.A.M.*, 32, p. 389] and mosaic [ibid., 30, p. 279] in Puerto Rico has already been noticed. Bunchy top has been detected in Santo Domingo, Haiti, and Jamaica in all of which its insect vector (*Empoasca papayae*) occurs. *E. dilitara*, common in Puerto Rico, though never collected from papaw, should be studied as a possible vector in Cuba. Mosaic virus is also found on papaw in Cuba and Florida and is transmitted by various aphid species. *Aphis spiraecola* is a potent vector in Puerto Rico. It is still unknown whether it is the same mosaic virus which occurs in all three places.

McKnight (T.). **A wilt disease of the Passion Vine (Passiflora edulis) caused by a species of Fusarium.**—*Qd J. agric. Sci.*, 8, 1, pp. 1–4, 2 figs., 1951. [Received May, 1953.]

A wilt disease of passion fruit vines caused by a species of *Fusarium* [*R.A.M.*,

25, p. 540] occurs on more advanced plants in plantations in south-eastern Queensland in February, May to July, and September to November, inclusive. In Mount Cotton, cultivation of this crop was discontinued on account of recurring epidemics. The disease causes complete collapse of the plant, sometimes within 24 to 48 hours. Spread is believed to be by root contact. Collapse is sometimes preceded by unilateral wilting. Prominent browning is present in the vascular system of the root, crown, and leaders, sometimes extending to 7 ft. up the stem. A vein-clearing with 'islands' of green interveinal tissue on the youngest unfolded leaf of seedlings inoculated with the causal *Fusarium* is an early symptom of the disease, detected seven to 10 days after inoculation, and precedes leaf shedding. The latter, starting with the loss of the cotyledons, occurs a fortnight after inoculation in the greenhouse.

Resistance tests showed *Passiflora alba* and *P. suberosa* to be susceptible. *P. foetida*, *P. flavicarpa*, and some plants of one strain of *P. edulis* showed some resistance. Control may be possible by selecting resistant plants or by top-grafting *P. edulis* to roots of resistant species.

Cunningham (G. H.). **Certification of therapeutants.**—*Orchard. N.Z.*, 25, *Suppl.*, 2 pp., 1953.

This is the 32nd list of certified plant therapeutants issued by the Plant Diseases Division, Auckland, New Zealand [cf. *R.A.M.*, 31, p. 247], for the benefit of orchardists, nurserymen, and farmers.

Poor man's autoblast.—*Comm. Gr.*, *1953*, 2975, p. 16, 1 fig., 1953.

Descriptions are given of the recently introduced autoblast [*R.A.M.*, 32, p. 492] systems for converting high-pressure trailer sprayers into air blast machines. Made by Messrs. Kent Engineering and Foundry Ltd., the Autoblast 5 converts any standard trailer sprayer (6 to 30 h.p.) into a high-, medium-, or low-pressure, high- or low-volume machine for £325. The Autoblast 4, designed to work behind the average tractor, is suitable for soft fruit and hops and costs £475.

Miller (L. P.), McCallan (S. E. A.), & Weed (R. M.). **Rate of uptake and toxic dose on a spore weight basis of various fungicides.**—*Contr. Boyce Thompson Inst.*, 17, 2, pp. 173–195, 3 graphs, 1953.

The rate of uptake, dose received, and toxicity were determined on a spore weight basis [see next abstract] for 2-heptadecyl-2-imidazoline, ferbam, silver, and cerium and for various fungi, including *Monilinia* [*Sclerotinia*] *fructicola* [*R.A.M.*, 31, p. 563], *Alternaria oleracea* [*A. brassicicola*], *Stemphylium sarciniforme* [ibid., 32, p. 389], *Glomerella cingulata* [ibid., 32, p. 326], *Aspergillus niger*, *Rhizopus nigricans* [*R. stolonifer*], *Cephalosporium acremonium*, *Neurospora sitophila*, *Venturia inaequalis*, and *V. pirina*, by means of radioactive tracer techniques at the Boyce Thompson Institute for Plant Research, New York.

The dose received, measured on a spore weight basis, was many times that indicated by the concentration of the external solution. Uptake of all the toxicants examined was surprisingly rapid. Most of the substance was usually absorbed in 30 seconds or less. *N. sitophila* was considerably more active than *A. niger* in absorbing imidazoline. The innate toxicity of this material to spores was relatively low, but control of germinative capacity was readily obtained by the rapid uptake and marked accumulation from dilute solutions. The ED_{50} values on a spore weight basis for *V. pirina* and *N. sitophila* were 9,250 and 5,800 p.p.m., respectively. On the same basis silver was the most toxic of all the materials tested, ED_{50} values from 85 to 540 p.p.m. being obtained with spores of four species from solutions containing 1·04 p.p.m.

Cerium was absorbed most rapidly and extensively by spores of *Alternaria brassicicola* and *Aspergillus niger*, but germination remained essentially unaffected. Although less toxicant was absorbed by spores of *Sclerotinia fructicola* germination was retarded; the ED_{50} value was 4,600 p.p.m.

These results emphasize the importance of determining dosage on a spore weight basis rather than according to the concentration of the applied solutions.

Miller (L. P.), McCallan (S. E. A.), & Weed (R. M.). **Quantitative studies on the role of hydrogen sulfide formation in the toxic action of sulfur to fungus spores.** —*Contr. Boyce Thompson Inst.*, 17, 2, pp. 151–171, 1 graph, 1953.

At the Boyce Thompson Institute for Plant Research, New York, quantitative estimations were made of the rate at which fungus spores exposed to elemental sulphur [*R.A.M.*, 29, p. 161; 32, p. 26] could absorb the substance and give off hydrogen sulphide, and the total quantity produced before ability to germinate was lost. Commercial sulphurs were three to five times as active as the best pure sulphur, while a colloidal sulphur was nine times more active than the best commercial. The production rate, expressed as mg. hydrogen sulphide per gm. spores per hour, varied from 0·023 for *Rhizopus nigricans* [*R. stolonifer*] to 6·39 for *Cephalosporium acremonium*. The total amount [of sulphur] taken up before inability to germinate resulted varied from about 4,500 to 10,000 p.p.m. on a spore weight basis [see preceding abstract] for *Alternaria oleracea* [*A. brassicicola*], *Monilinia* [*Sclerotinia*] *fructicola*, *Glomerella cingulata*, and two mutants of *Neurospora crassa*. The last-named and *C. acremonium* gave off hydrogen sulphide in amounts up to 22,000 and 54,000 p.p.m. of spore weight, respectively, without complete inhibition of germination, the figure for *Stemphylium sarciniforme* before germination was affected being 430 p.p.m., while over 90 per cent. germination was secured with *Aspergillus niger* and *R. stolonifer* after the spores had produced 4,000 to 9,700 p.p.m. hydrogen sulphide.

Comparative tests on the toxicity of hydrogen sulphide and sulphur under conditions preventing loss of the gas through diffusion into the atmosphere and its oxidation to sulphur showed colloidal sulphur to be more toxic to some fungi than an equivalent amount of hydrogen sulphide.

Sulphur reduction to hydrogen sulphide was not inhibited by 1×10^{-3} M. potassium cyanide, semicarbazide, hydroxylamine, or sodium azide. It was somewhat sensitive to sodium bisulphite and highly so to sodium arsenite, which had some inhibitory power at $6{\cdot}4 \times 10^{-5}$ M. The presence of methylene blue retarded gas production until the dye was decolorized and 2,3-dichloro-1,4-naphthoquinone prevented gas production at 6×10^{-4}.

These results indicate that the measurement of hydrogen sulphide emission is a good test of the efficacy of a preparation and that it should be possible to obtain more efficaceous formulations for commercial use. The role of hydrogen sulphide in the toxic action of sulphur to fungus spores may have been exaggerated hitherto. For the present it is suggested that sulphur exerts its effect through its action as a hydrogen acceptor and therefore through its interference in the normal dehydrogenation and hydrogenation reactions.

1951 summary of results of fungicide tests in the United States and Canada.—*Plant Dis. Reptr, Suppl.* 213, pp. 109–140, 1952. [Multilithed.]

The condensed results of the 1951 fungicide tests on vegetables, fruit, field and forage crops, and ornamentals, and soil treatments [cf. *R.A.M.*, 32, p. 88], based on the reports of the numerous contributors from various parts of the United States and Canada, are summarized on the usual lines, together with a list of new materials (and their active ingredients) tested since the previous trials [loc. cit.].

Müncheberg (P.). **Chemie und Technologie der Fungicide.** [Chemistry and technology of fungicides.]—*Chemikerztg*, 77, 2, pp. 38–40; 3, pp. 66–68, 1953. [English, French, and Italian summaries.]

Eleven contributions to the literature were consulted in the preparation of this description of the production and application of approved fungicides with sulphur and copper bases. A concluding section deals with current developments, still in the initial stages, in the use of organic materials as plant protectives, a further extension of which is to be anticipated [cf. *R.A.M.*, 32, p. 491].

Nilsson (P. E.) & Bingefors (S.). **A method for routine testing of seed treatments in the laboratory.**—*LantbrHögsk. Ann.*, 18, pp. 106–112, 1951. [Abs. in *Biol. Abstr.*, 27, 1, p. 237, 1953.]

When uspulun 1875, granosan (ceresan), and arasan were tested at the Royal Agricultural College, Uppsala, Sweden, for fungicidal efficacy on flax seed heavily infested with *Colletotrichum lini* [*C. linicola*], ceresan and arasan were more effective than uspulun, ceresan being better than arasan. In other tests on wheat and rye uspulun gave better results than prosat [cf. *R.A.M.*, 32, p. 14].

Sumiki (Y.), Yamamoto (K.), & Takedi (K.). **Invert soaps as fungicides.**—*J. agric. chem. Soc. Japan*, 26, pp. 325–328, 1952. [Abs. in *Chem. Abstr.*, 47, 7, pp. 3505–3507, 1953.]

The authors discuss the preparation and composition of various invert soaps and give the following dilutions determined in tests at the University of Tokyo, Japan, which showed the same fungicidal activity as 0·1 per cent. uspulun against the spores of *Gibberella fujikuroi* [*R.A.M.*, 31, p. 575]: (*a*) dimethylalkylbenzylammonium chloride with eight carbon atoms in the alkyl group, 10^2; (*b*) with 12 carbon atoms, 8×10^4; (*c*) with 16 carbon atoms, $1{\cdot}6\times10^5$; (*d*) with 18 carbon atoms, $1{\cdot}2\times10^5$; (*e*) dimethyldodecyl (methylthiolethyl) ammonium chloride, 10^4; (*f*) nicotine-*N*, *N'*-bis (dodecyl chloride), 4×10^3; and (*g*) two complex derivatives of (*e*), 8×10^4 and $2{\cdot}2\times10^5$.

Katalogbuch über Pflanzenschutz- u. Schädlingsbekämpfungs-, Bautenschutz- und Holzschutzmittel sowie Pflanzenschutzgeräte. [Catalogue of plant-, pest control-, building-, and timber-protectives, together with plant protection equipment.]—281 pp., Norddeutsches Kalkkontor, Hamburg 1, 1953. DM. 8.20.

Up-to-date information is presented on the chemical composition, mode of packaging, and wholesale and retail prices of the plant protectives and fertilizers in current use in Germany, together with directions for their application [*R.A.M.*, 32, p. 491]. Particulars are given of various types of spraying and dusting machinery, while other useful features include full instructions for seed treatment by various methods and for potato blight (*Phytophthora infestans*) control, and a table showing the possibilities of fungicide and insecticide combinations.

Koch (H.). **Die amtliche Prüfung der Pflanzenschutz- und Vorratsschutzgeräte unter besonderer Betrachtung der technischen Prüfung.** [The official testing of machinery for the protection of plants and stores, with special consideration of the technical assay.]—*NachrBl. dtsch. PflSchDienst* (*Braunschw.*), *Stuttgart*, 5, 2, pp. 23–29, 9 figs., 2 graphs, 1953.

The methods employed at the Brunswick branch of the German Biological Institute in the testing of plant protection apparatus, including spraying and dusting equipment, are fully described.

Gausman (H. W.), Rhykerd (C. L.), Hinderliter (H. R.), Scott (E. C.), & Audrieth (L. F.). **Fungicidal properties of some carbonic and thiocarbonic acid derivatives of hydrazine.**—*Bot. Gaz.*, 114, 3, pp. 292–296, 1 fig., 1953.

During investigations sponsored by the Departments of Agronomy and Chemistry, University of Illinois, on the growth of *Helminthosporium sativum*, *Rhizoctonia* sp., and *Pythium* sp. cultured at room temperature on potato dextrose agar containing different amounts of carbonic or thiocarbonic acid derivatives of hydrazine, the following effectively inhibited the three test fungi: 1-phenylthiocarbohydrazide, thiocarbohydrazide, thiosemicarbazide, hydrazine sulphate, and methyl hydrazine sulphate, all at concentrations over 500 p.p.m. Correlations between structure and fungicidal activity are discussed.

Dobie (N. D.), Young (R. A.), Rodgers (J. B.), & Milbrath (J. A.). **A new method for application of chloropicrin in warehouse fumigation.**—*Phytopathology*, 42, 12, pp. 693–694, 1 fig., 1952.

A thermo-aerosol method for rapid fumigation of warehouses with chloropicrin is described from the Oregon Agricultural Experiment Station. Steam from a flash-type generator is led into the house (where a relative humidity approaching saturation and a temperature of 70° C. are maintained) through a high-pressure steam hose equipped at the discharge end with a venturi nozzle. Then the venturi lead-in tube is attached to a rubber hose connected to a siphon apparatus containing chloropicrin. The passage of steam through the nozzle draws the chemical into the steam. The rate and flow of the chloropicrin are regulated by clamp or valve connexions.

In preliminary tests in an experimental unit with a volume of 250 cu. ft., spores of *Fusarium 'roseum'* in a $\frac{1}{4}$ in. layer of moist sand in a dish were destroyed at concentrations of $\frac{1}{27}$ lb. chloropicrin per 1,000 cu. ft., while in five out of seven large, sweet potato warehouses $\frac{1}{8}$ lb. sufficed for thorough disinfection. Used at the rate of $\frac{1}{4}$ lb., which gave consistently successful results, the cost of treatment for 1,000 cu. ft. would be 25 cents.

Appel (O.), Ed. **Sorauer (P.). Handbuch der Pflanzenkrankheiten. Sechster Band. Pflanzenschutz. Verhütung und Bekämpfung der Pflanzenkrankheiten. Zweite neubearbeitete Auflage.** [Handbook of plant diseases. Volume VI. Plant protection. Prevention and control of plant diseases. Second revised edition.]—Lieferung 1, xv+448 pp., 3 graphs, Berlin, Paul Parey, 1952. [Received July, 1953.] DM. 78.

The first part of this revised edition of Sorauer's standard treatise on plant disease [cf. *R.A.M.*, 23, p. 350] comprises two sections, the first on the economic importance of plant protection, contributed by H. Morstatt, and the second on the functions of plant protection, prepared by H. Braun in collaboration with W. H. Fuchs and G. Gassner.

Myers (Amy). **A manual of seed testing.**—80 pp., 11 pl., 2 diags., Sydney, A. H. Pettifer, New South Wales Government Printer, 1952. 2*s.* 6*d.* net.

This booklet on seed testing, written for the benefit of seed analysts in commercial laboratories and particularly for students, contains a chapter on the sanitary condition of seeds (pp. 58–64), in which the information provided is taken from Dr. L. C. Doyer's book [*R.A.M.*, 18, p. 265].

Thomas (W. D.). **Estimated losses in yields due to diseases of major crops in Colorado for 1952.**—*Plant Dis. Reptr*, 37, 2, pp. 118–120, 1953. [Multilithed.]

A list compiled by the Department of Botany and Plant Pathology, Colorado A

and M College, is given of percentage losses in yield induced by various diseases of the major crops in Colorado in 1952. Among the most serious were those due to wheat root rots (*Helminthosporium*, *Pythium*, and *Fusarium*) and lucerne bacterial wilt (*Corynebacterium insidiosum*) [see above, p. 564] both 8 per cent.; potato early blight (*Alternaria solani*) [ibid., 31, p. 392] 7; tomato wilt (*Fusarium oxysporum* f. *lycopersici*) [*F. bulbigenum* var. *lycopersici*: ibid., 31, p. 636] 12; onion bulb rot (*F. o.* f. *cepae*) [cf. ibid., 12, p. 614; 25, p. 543] 20; cantaloupe wilt (*F. o.* f. *melonis*) and *Fusarium* fruit rot (*F.* spp.) both 20; strawberry red stele (*Phytophthora fragariae*) [ibid., 32, p. 388] and root rots (various) 25; and carnation virus diseases (mosaic, streak, and yellows) 20 and *Fusarium* diseases (*F.* spp.) 18.

Vasudeva (R. S.) & Gattani (M. L.). **Assessment of losses caused by plant diseases.** —*Indian J. agric. Sci.*, 21 (*1951*), 4, pp. 409–412, 1952. [Received May, 1953.]

A brief review is given of the various methods for determining losses caused by plant diseases [*R.A.M.*, 31, p. 73]. So far, little systematic work has been done in this field in India, but a scheme on these lines, started in 1947–8, is now in progress.

Weiss (F.) & O'Brien (Muriel J.). **Index of plant diseases in the United States. Part IV. Guttiferae-Phytolaccaceae. Part V. Pinaceae-Zygophyllaceae.**— *Spec. Publ. Plant Dis. Surv.* 1, part IV, pp. 530–806, 1952; V, pp. 809–1192, 1953. [Mimeographed.]

Parts IV and V of this publication [cf. *R.A.M.*, 30, p. 481] complete the work; the Index, containing lists of Latin names and common names of hosts compiled by Muriel J. O'Brien and a list of authors of plant parasitic names with dates and recommended abbreviations compiled by J. A. Stevenson, is issued as a separate part (pp. 1195–1263). [Multilithed.]

Siang (W. N.). **Host index to non-fungus diseases of plants in China.**—*Plant Dis. Reptr, Suppl.* 215, pp. 165–186, 1952. [Multilithed.]

Among the non-fungus diseases of plants in China included in this host index are deficiency disorders and those caused by bacteria and viruses [*R.A.M.*, 19, p. 553]. The distribution records of each disease are given with reference to a bibliography of 54 titles.

Pontecorvo (G.) & Sermonti (G.). **Recombination without sexual reproduction in Penicillium chrysogenum.**—*Nature, Lond.*, 172, 4368, pp. 126–127, 1953.

In further work at the Department of Genetics, University of Glasgow, the original technique [*R.A.M.*, 32, p. 439] has been successfully adapted to *Penicillium chrysogenum*. Results are sufficient to show that heterozygous diploid strains can be synthesized in *P. chrysogenum* and that these diploids give rise to strains associating and recombining the properties of the parent strains.

Roodenburg (J. W. M.). **The influence of day-length on the health of plants.**— *Tijdschr. PlZiekt.*, 58, 6, pp. 240–242, 1952.

The author cites some examples of the protection conferred on various plant seedlings growing in greenhouses, e.g., against damping-off (*Rhizoctonia*), at different horticultural centres in Holland by nocturnal illumination with incandescent light to increase the length of day in the winter months. The longer days noticeably improved plant health.

Niethammer (A[nneliese]) & Schmid (I.). **Untersuchungen über Kernverhältnisse, sowie Anastomosenbildung und deren Beziehungen zur Abscheidung**

antibiotischer Substanzen bei Penicillien, Fusarien, und Cladosporium herbarum. [Studies on nuclear relations and formation of anastomoses and their connexions with the secretion of antibiotic substances in *Penicillia*, *Fusaria*, and *Cladosporium herbarum*.]—*Z. PflKrankh.*, 59, 9–10, pp. 321–323, 2 figs., 1952. [English summary.]

At the Botanical Institute of the Technical College, Stuttgart, hyphal anastomoses developed in cultures of *Penicillium chrysogenum* and *P. notatum* in a nutrient solution supplemented by 1 or 5 per cent. glucose, while well water stimulated their formation in *Fusarium* spp. Hyphal fusions were more abundant in antibiotic-producing strains of *Penicillium* than in inactive ones, and the process was apparently favoured by adverse nutritional factors.

Juraszek (Helena). **Klucz do określania chorób roślin uprawnych. Zeszyt 2. Choroby roślin motylkowych.** [Key for the identification of diseases of cultivated plants. No. 2. Diseases of Papilionaceae.]—67 pp., 35 figs., Warsaw, State Agricultural and Forestry Publishers, 1951.

This well-illustrated key, written for the easier identification of the major fungal and bacterial diseases of Papilionaceae in Poland, contains descriptions of the symptoms of each disease and its pathogen listed separately under the host plants. A bibliography of 30 titles is appended with indexes of Latin and Polish names of diseases and hosts.

Clark (E. W.). **A substitute for drawing ink in the preparation of diagrams for photographic reproduction.**—*Science*, 117, 3050, pp. 665–666, 1953.

The pencil 'Mars lumograph' (J. S. Staedtler, Inc.) was found to be a highly satisfactory substitute for Indian ink in the preparation of line drawings for photographic reproduction. Material prepared with this pencil photographed exceedingly well because of the flat, black line produced. The EXB grade gave the best all-round results, though for filling in solid areas EX–EXB is recommended.

Viel (G.), Hascoet (M.), & Duclos (Mauricette). **Semi-microméthode par molybdomanganimétrie pour le dosage des dépôts laissés sur les végétaux par les composés zinciques.** [A semi-micromethod based on molybdomanganimetry for measuring the deposits left on plants by zinc compounds.]—*Ann. Inst. nat. Rech. agron.*, Sér. C. (*Ann. Épiphyt.*), 3, 2, pp. 273–280, 1952.

An electrolytic method for estimating zinc is described, the use of which permits the rapid and accurate estimation of zinc content of fungicidal deposits, including organic zinc compounds.

Ninomiya (T.) & Hino (I.). **Wide application of the 'copper-sulphate reaction' method in various fields of scientific researches.**—*Bull. Fac. Agric. Yamaguti Univ.* 2, pp. 13–22, 1951. [Received May, 1953.]

The copper sulphate reaction method was proposed by Hino *et al.* in 1941 (*Ann. phytopath. Soc. Japan*, 11, pp. 45–47) for the diagnosis of virus-infected potatoes. Later, Hino published further applications of this method (ibid., 14, p. 100, 1950) for estimating the quantitative distribution of virus in a plant and for diagnosing infection of wheat and barley by smuts [*Ustilago* spp.].

In this paper a modified experimental method is described. The material under test was heated in a test-tube with 1·5 to 2 ml. of 1 to 2 N potassium hydroxide and then with 2·5 to 4 ml. of 0·5 per cent. copper sulphate solution added. Usually the reaction was completed in 1 to 2 hours. The time and weather when material was collected made no significant difference to the result, but the leaf, stem, fruit, and

root gave different colour reactions. Differentiation between plant varieties and species was also possible.

Brancato (F. P.) & Golding (N. S.). **Gas requirements of molds : the importance of dissolved oxygen in the medium for germination and growth of several molds.** —*Northw. Sci.*, 27, 1, pp. 33–38, 1 diag., 1 graph, 1953.

The results of further studies on the gas requirements of moulds concerned in food spoilage in the State of Washington [*R.A.M.*, 30, p. 424] suggested that *Aspergillus niger*, *A. flavus*, *Geotrichum candidum*, *Penicillium notatum*, *P. roqueforti*, and *P. expansum* can utilize oxygen dissolved in the medium for germination and growth. Resazurin, an oxidation-reduction indicator dye, proved useful for the visible demonstration of the solution of oxygen in the medium.

Hsiung (G.-D.) & Lucas (E. H.). **An antifungal principle in the cell of Achromobacter iophagum.**—*Quart. Bull. Mich. agric. Exp. Sta.*, 35, 1, pp. 95–101, 3 figs., 1952.

In cultural studies at Michigan State College Agricultural Experiment Station, East Lansing, *Achromobacter iophagum* [*R.A.M.*, 28, p. 512], isolated from a fresh morel [*Morchella* sp.], was found to inhibit the growth of common moulds, such as *Alternaria* sp., *Penicillium* sp., *Trichoderma* sp., *Aspergillus niger*, and *A.* sp., and some isolates from raspberries, including *Alternaria humicola*, *T. viride*, *Helminthosporium anomalum*, *Penicillium* sp., *Phoma* sp., and *Pullularia pullulans*.

Waksman (S. A.). **The Actinomycetes and their antibiotics.**—*Nieuwland Lectures*, 6, 53 pp., 9 figs., 3 graphs, 1952. [Received 1953.]

In this course of three lectures the general features of the Actinomycetes are carefully examined, the nature, formation, and utilization of antibiotics in general discussed, and the antibiotics of actinomycetes [cf. *R.A.M.*, 32, p. 496] listed and described. A bibliography of 22 titles is appended.

Toyama (N.). **Cellulose assimilation of molds.**—*J. Ferm. Technol.*, 30, pp. 89–93, 1952. [Japanese, with English summary. Abs. in *Chem. Abstr.*, 47, 11, p. 5679, 1953.]

At Miyazaki University, Japan, filter paper, dried ramie [*Boehmeria nivea*], wheat gluten, or soluble starch was added to Czapek's medium modified by the substitution of ammonium sulphate for sodium nitrate, and observations were made on the cellulose decomposition [*R.A.M.*, 32, p. 495 and next abstract], pectin decomposition, and the enzyme action of several moulds. In general, the cellulose- and pectin-decomposing species were weak in protease and amylase activity. *Trichoderma koningi* [*T.* ? *viride*] exerted the strongest action on cellulose [ibid., 31, p. 450] and disorganized cotton fibre in submerged cultures, but did not attack pectin to any extent. A species of *Fusarium* which grew well on filter paper but not on cotton fibre was strong in pectinase and protease activity.

Ishimatsu (Y.) & Toyama (N.). **Cellulose decomposition by Trichoderma koningi.** —*J. Ferm. Technol.*, 30, pp. 409–414, 1952. [Japanese, with English summary. Abs. in *Chem. Abstr.*, 47, 11, p. 5679, 1953.]

A pH of 6 and a temperature of 25° C. were optimum for cellulose decomposition by *Trichoderma koningi* [*T.* ? *viride*] in submerged cultures on a modified Czapek's medium [see preceding abstract]. The best sources of nitrogen were ammonium sulphate (1 per cent.) and ammonium nitrate, followed by ammonium phosphate and sodium nitrate. Sodium glutamate and peptone favoured fungal growth but not cellulose decomposition. Fairly good results were obtained with potassium

dihydrogen phosphate. Cotton fibres attacked by *T.* ?*viride* were shortened to an average length of 400 to 900 μ and lost weight; they were indistinguishable from the controls on reaction with iodine.

JERMYN (M. A.). **Fungal cellulases. I. General properties of unpurified enzyme preparations from Aspergillus oryzae. II. The complexity of enzymes from Aspergillus oryzae that split β-glucosidic linkages, and their partial separation. III. Stachybotrys atra: growth and enzyme production on non-cellulosic substrates.**—*Aust. J. sci. Res.*, Ser. B, 5, 4, pp. 409–432, 433–443, 17 graphs, 1 diag., 1952; *Aust. J. biol. Sci.* (formerly *Aust. J. sci. Res.*, Ser. B), 6, 1, pp. 48–69, 8 graphs, 1953.

In studies at the Biochemistry Unit, Wool Textile Research Laboratory, C.S.I.R.O., Melbourne, the culture filtrate of *Aspergillus oryzae* was found to contain enzymes able to depolymerize sodium carboxymethyl cellulose and to split all β-glucosides tested [cf. *R.A.M.*, 30, p. 530]. These enzymes were produced by the mould in the absence of cellulose or other carbon source containing β-glucosidic linkages.

Filter-paper electrophoresis and paper chromatography demonstrated that the crude enzyme preparation contained at least eight components capable of breaking β-glucosidic linkages and possessing varying degrees of specificity towards different substrates. Attempts to separate and purify various enzymes gave results agreeing with the hypothesis of multiple enzyme components.

Further data obtained with *Stachybotrys atra* on modified Waksman-Carey medium gave no support for the existence of 'C_x' [ibid., 30, p. 115] as a separate enzyme produced by the mould only in response to the presence of polymeric β-glucosidic linkages.

KOWALIK (R.). **Microörganisms destroying paper in Polish archives.**—*Med. dośw. mikrobiol.*, 4, pp. 359–360, 1952. [Abs. in *Chem. Abstr.*, 47, 10, p. 4953, 1953.]

Organisms isolated from paper in Polish archives [cf. *R.A.M.*, 18, p. 696; 32, p. 495] included species of *Alternaria*, *Botryotrichum*, *Chaetophoma*, *Cephalosporium*, *Cladosporium*, *Curvularia*, *Dicoccum*, *Epicoccum*, *Fusarium*, *Gliocladium*, *Mycogone*, *Penicillium*, *Pullularia*, *Scopulariopsis*, *Sepedonium*, *Stachybotrys*, *Trichoderma*, and *Verticillium*, *Aspergillus fumigatus*, *A. wentii*, *A. niger* var. *luchuensis*, *Chaetomium spirale*, *C. crispatum*, *C. magnum*, *C. indicum*, *Stemphylium botryosum* [*Pleospora herbarum*], *S. graminis*, and *S. macrosporoideum* [*Acrospeira macrosporoidea*]. A paper containing 95 per cent. α-cellulose, with copper number 1·0 and a pH of 5·5 to 6, should be used for archives, and the addition of ziram during manufacture is recommended.

BÖNING (K.). **Pflanzenernährung und Pflanzenschutz.** [Plant nutrition and plant protection.]—*Z. PflBau*, 3 (47), 5, pp. 193–212, 1952.

In a lecture given at Munich on the 50th anniversary of the Bavarian Institute for Agriculture and Plant Protection on 28th November, 1952, the author discussed, in the light of up-to-date knowledge, the problem of plant nutrition in relation to some well-known diseases, references to which have appeared from time to time in this *Review*.

SEMPIO (C.). **Meccanismi di resistenza nelle piante con particolare riguardo a quelli di tipo metabolico.** [The mechanisms of plant resistance with particular reference to those of a metabolic nature.]—*Atti Accad. Georgof. Firenze, 1949*, 20 pp., 1950.

The author defines certain terms denoting biological associations between higher plants and pathogens and classifies and discusses various resistance mechanisms by

which the plant is protected from attack, particularly those involving metabolic processes [*R.A.M.*, 28, p. 351].

Togliani (F.). **Determinazione del punto isometabolico per la Deuterophoma tracheiphila allevata in substrati colturali a base glucosica.** [Determination of the isometabolic point for *Deuterophoma tracheiphila* grown in cultural media with a glucose base.]—*Ann. Sper. agr.*, N.S., 6, 5, pp. 1153–1160, 6 graphs, 1952. [English summary.]

The author's studies demonstrated that the isometabolic point [*R.A.M.*, 31, p. 508] for the growth of *Deuterophoma tracheiphila* [cf. ibid., 31, p. 604] in a mineral salts solution supplemented by 2 per cent. dextrose at +23° C., and adjusted to different pH values was approximately pH 6·1.

Saksena (R. K.), Jain (S. K.), & Jafri (S. M. H.). **Sulphur and nitrogen requirements of the genus Pythium.**—*J. Indian bot. Soc.*, 31 (*1952*), 4, pp. 281–286, 1953.

Further studies on the nutritional requirements of *Pythium* spp. [cf. *R.A.M.*, 21, p. 91] carried out at Allahabad University demonstrated that they utilize sulphur from both organic and inorganic sources. They do not grow in nutrient solutions lacking in sulphur or nitrogen. A rise in pH occurring after incubation was due to accumulation of ammonia.

Hutton (E. M.) & Peak (A. R.). **The selection of spotted-wilt-resistant phenotypes in the Potato (Solanum tuberosum).**—*Aust. J. agric. Res.*, 3, 2, pp. 137–147, 2 pl., 1952.

In studies at the Division of Plant Industry, Canberra, Australia, hand inoculation of leaves for determining the resistance of phenotypic potato varieties and hybrids to [tomato] spotted wilt virus [*R.A.M.*, 32, pp. 62, 235] was unsatisfactory. Good results, better than differentiation in field epidemics, were obtained by stem-tip inoculations of vigorously growing glasshouse plants at the flowering stage, using the technique already described [loc. cit.] and a strain mixture from field-infected tomatoes or a culture (mainly the ring spot strain) isolated by passage of the strain mixture through *Nicotiana glutinosa* (*Bull. Coun. sci. industr. Res. Aust.* 202, 1946) [see above, p. 559].

Phloroglucinol staining of infected stems [*R.A.M.*, 31, p. 624] indicated that spotted wilt affects the same tissues of the potato as does virus Y. Studies of the movement of the virus demonstrated that varieties like Brownell are highly tolerant and that the tip blight and necrotic strains of a mixture take part in the early stages of systemic infection in susceptible varieties. A high percentage of the hybrids bred by the authors were resistant.

Large (E. C.). **The interpretation of progress curves for Potato blight and other plant diseases.**—*Plant Path.*, 1, 4, pp. 109–117, 16 graphs, 1952.

The assessment key prepared by the British Mycological Society [*R.A.M.*, 27, p. 89] for measuring potato blight [*Phytophthora infestans*: see next abstract] on the haulm is reproduced and the author reviews and discusses some of the many uses for the blight progress curves obtained by its aid. The 'half decay' (or 50 per cent. date) and the slope of the time–percentage curve give a definition of the whole course and timing of an epiphytotic; the curves reveal that it usually takes at least a month to run its full course [ibid., 32, p. 446]. The curves are steep when humidity and temperature conditions favour sporulation; they are more gently inclined and sometimes long drawn-out when dry weather follows the outbreak and sporulation is checked. Four or five observations over the course of the attack suffice to establish the general sweep of the curve. To record the starting-point

(taken as 0·1 per cent. blight in the key) fairly accurately, inspection is recommended at ten-day intervals from the earliest date at which outbreaks are ever likely to occur locally.

If plotted in groups the progress curves can provide charts for the study of regional and seasonal differences. Such charts, compiled from data sent in by the National Agricultural Advisory Service in connexion with the Potato Blight Forecasting and Progress Survey, are given for six regions in 1950 and 1951; they indicate that in 1950 [ibid., 31, p. 77] protective spraying could have increased the crop substantially in all six areas, whereas in 1951 it would have given little increase in any.

Assuming that useful growth is over when the assessment figure reaches 75 per cent. it is possible to estimate from the date of cessation of growth and from average yield curves the expected loss in yield. A blight curve in which the 75 per cent. point is reached by the end of July indicates a probable yield loss of about 50 per cent., or in mid-August 28 per cent. The usual type of curve obtained in 'blight' years (75 per cent. by the end of August) probably indicates about 13 per cent. loss, while one not reaching that level until mid-September indicates about 4 per cent. only.

Progress curves for blight in spraying trials [ibid., 25, p. 314] and in haulm destruction trials [ibid., 32, p. 395] reflect the course of reduction in the photosynthetic area of the foliage and weight of the haulm. Such curves provide the means of checking the stage at which tuber production ceases. Progress curves can also be made for potassium deficiency effects [ibid., 32, p. 447], often confused with blight symptoms.

It is concluded that when progress curves have been made and related to yields in carefully conducted spraying trials at a few well-chosen centres for some years, it will be possible to estimate the probable crop loss that any given type of curve represents, in any area, according to the variety and the seasonal growing conditions. If simple eye assessments of haulm infection are made on representative crops in all areas over a sufficient number of years to cover the wide seasonal variation, a body of records will be built up which will enable advisers to decide spraying policy. It will become possible to indicate regions where protective spraying is (1) desirable every year on certain varieties, (2) uneconomic except under certain weather conditions, and (3) not justified at all. The very different regional zoning for haulm destruction will also be determinable.

The methods outlined could be applied to a wide range of plant diseases and disorders.

Potato blight forecasting investigation in England and Wales, 1950–52.—*Plant Path.*, 2, 1, pp. 1–15, 4 maps, 3 graphs, 3 charts, 1953.

This report from the Conference of Plant Pathologists, National Agricultural Advisory Service, compiled by E. C. Large summarizes the results of the first three years of an investigation of the possibilities of forecasting outbreaks of potato blight (*Phytophthora infestans*) [cf. *R.A.M.*, 31, p. 204 and preceding abstract] by the Beaumont rule [ibid., 32, p. 501] throughout England and Wales, utilizing for this purpose a network of about 40 synoptic weather stations making hourly observations of temperature and humidity. At the close of the season the sites of the outbreaks were plotted on a map and their distances and bearings from the weather stations measured. The dates of outbreak were charted on a time scale against the critical periods at the nearest weather station.

The British Mycological Society's key [see preceding abstract] was used throughout. Blight at 0·1 per cent. in a potato field was considered to constitute an 'outbreak'. Fortnightly assessments on a limited number of fields in each area were made each year throughout the growing period and progress curves [loc. cit.]

were compiled. The persistence of the disease at the outbreak stage for some weeks is of particular significance in forecasting, as it suggests that 'date of outbreak' is often more truly represented by a period of time. Over 1,000 records made on 'blight notification slips' issued to collaborators throughout the country were obtained each year. Plant pathologists recorded the data as the slips came in, thus securing a day-to-day local record, and forwarded them at once to the Plant Pathology Laboratory, Harpenden, where they were indexed, and the records charted side by side with the observations from the meteorological stations.

The data obtained demonstrated that when the occurrence of Beaumont periods are notified from the synoptic weather stations broad regional forecasts of date of blight outbreak can be made successfully for all parts of England and Wales, provided that the indications from the entire network of stations are taken into account by an operations-chart method of working. A few of the weather stations were found to be of little value in the network except, perhaps, as indicators of very local conditions or extreme general conditions. Other stations may be expected to give indications valid only for a limited section of their zone. Supplementary stations are required in some areas.

Every year outbreaks on some of the more forward maincrops often preceded the general outbreak. There was strong indication that the 'zero date' (before which Beaumont periods are not followed by general outbreaks on maincrops) is about the last week in June except in the south-west, the west coastal areas, and possibly round the Wash. Experience in more seasons is necessary before 'zero dates' can be given with confidence for all parts, and the forwardness of the potato crops should be taken into account in estimating the possible validity of early warnings. There was also an indication that forecasting from weather station reports is more reliable in July and early August (when a spray warning service is required) than earlier or later.

The blight progress curves obtained indicated that there is no constant relation between the date of outbreak and the date at which rapid destruction of the haulm begins. Cumulative rainfall curves [ibid., 31, p. 204] have been plotted against blight progress for all stations for 1950, 1951, and 1952, but curves for more years are necessary before the bearing of cumulative rainfall on blight development in England and Wales can become apparent. Further investigations are in progress.

Waggoner (P. E.) & Wallin (J. R.). **Variation in pathogenicity among isolates of Phytophthora infestans on Tomato and Potato.**—*Phytopathology*, 42, 12, pp. 645–648, 1952.

The authors' studies at the Iowa Agricultural Experiment Station on variation in pathogenicity among isolates of *Phytophthora infestans* from tomato and potato [*R.A.M.*, 32, pp. 395, 403, 446, 501] proceeded in three steps. The first involved the definition, in terms of the average amount of disease produced, expressed as a mathematical function of four factors, namely host, pathogen, environment, and development time, of four types of variants or races, namely (*a*) pathic, those causing significantly different amounts of disease under all conditions; (*b*) hostic, causing significantly differential amounts of disease only on different hosts; (*c*) environmental, inducing significantly differential amounts of disease only in divergent environments; and (*d*) developmental, giving significantly differential rates of disease development under all conditions. Significant interactions indicate that the expression of one of these races is modified by one or two of the other factors.

The second step consisted in the demonstration of hostic races by tests on greenhouse and field plants and detached leaves. The fungus was cultured on soy-bean dextrose agar. Two hostic races were differentiated: the tomato race [loc. cit.], whether isolated from tomato or potato, was more pathogenic and developed more rapidly and sporulated more profusely on the former than did the potato race,

but on potato the two races were about equally pathogenic. They were most frequently isolated from their own host but could also be obtained from the other one. Manifestation of hostic races was more pronounced when a sporangial suspension was used for inoculation than with a zoospore suspension, and when assessed at a longer period (232 hours) after inoculation.

The third step demonstrated the stability of hostic races. A different race was not produced by the culture of isolates from potato tubers on detached tomato and potato leaflets. Moreover, it accounted for the isolation from potato tubers of typical tomato race strains and from tomato fruits of characteristic potato isolates.

Josifović (M.) & Šutić (D.). Прилог познавању порекла и начина настајања примарних зараза Кромпира од. **Phytophthora infestans De By.** [Contribution to the knowledge of the origin and initiation of primary infections of Potato by *Phytophthora infestans* de By.]—Год. пољоп. Фак., Београд [*Yearb. Fac. Agric., Beograd*], *1952*, 4, pp. 3–10, 1 pl., 1952. [French summary.]

In pot and greenhouse experiments to investigate the origin of primary infections of potato blight (*Phytophthora infestans*) [*R.A.M.*, 31, p. 349] carried out in Yugoslavia in 1949 and 1950, very young sprouts growing from the healthy side of an infected tuber suddenly stopped growing and rapidly died when the subjacent tissue became infected. These sprouts were not invaded by mycelium nor were sporangia observed on them even under favourable conditions of temperature and humidity for fungal growth. Sprouts developing roots and first leaves before mycelial invasion of the subjacent tissue continued normal growth and remained healthy. Sprouts originating from partially affected tubers may be attacked in the soil by mycelium and sporangia which develop on the surface of the affected parts and grow rapidly over the shoots. Such shoots never emerge. If, however, the shoots are able to develop roots and first leaves they are not then attacked by the underground mycelium, even though they may be in contact with it. When inoculum was placed 2 to 3 cm. above healthy tubers in sterilized soil the shoots were infected when they penetrated the zone containing the fungus, the tips, particularly, being attacked and killed. Young tubers and stolons were invaded in the same way. It is concluded, therefore, that the primary infection of leaves must take place exclusively by means of sporangia which have developed either on the surface of diseased tubers or on young sprouts in the soil [cf. ibid., 7, p. 52]. The sporangia may be brought to the surface during hoeing or by soil inhabiting insects.

Lorenzini (G.). **La lotta contro il Synchytrium endobioticum a mezzo di razze resistenti di Patate nell' anno 1951.** [The control of *Synchytrium endobioticum* by resistant races of Potato during the year 1951.]—*Notiz. Malatt. Piante, 1952*, 20, pp. 35–41, 1952. [English summary p. 51. Mimeographed.]

In further trials carried out near Milan in 1951 with potato varieties resistant to *Synchytrium endobioticum* [*R.A.M.*, 31, p. 76] Voran was most resistant, though Ackersegen was severely affected [cf. ibid., 32, p. 208]. Majestic was resistant, but was attacked by *Actinomyces* [*scabies*]. The susceptibility of Ackersegen and the somewhat unusual symptoms it displayed may indicate the presence of a new physiologic race of the fungus.

Oswald (J. W.) & Wright (D. H.). **Potato scab.**—*West. Gr. & Shipp.*, 23, 7, pp. 65–66, 1952. [Abs. in *Biol. Abstr.*, 27, 3, p. 731, 1953.]

During 1950 some 10,000 acres of spring potatoes in Kern County, California, could not be harvested because of a severe attack of scab [*Actinomyces scabies*: *R.A.M.*, 31, p. 628]. Soil applications of sulphur at the rate of 1,500 to 2,500 lb.

per acre (pH 4 to 5·3 at harvest) had small effect the first year, but controlled the disease in three or four subsequent crops. A cotton crop is recommended for the first year after the sulphur treatment. The acidified soil can be limed to pH 6·7 for lucerne, onions, and sugar beet without increasing scab in the first subsequent potato crop.

South American leaf blight of Rubber.—*Plant. Bull. Rubb. Res. Inst. Malaya*, N.S., 5, pp. 35–38, 2 col. figs., 1953.

This is a popular description of the symptoms and importance of the rubber leaf blight disease (*Dothidella ulei*) [C.M.I. map No. 27] which is not yet known to occur in Malaya. Preliminary measures for dealing with the disease, should its presence be suspected in any area, are described.

Saccas (A. M.). **Les principales maladies cryptogamiques de l'Hévéa en A.E.F. (Fin).** [The principal cryptogamic diseases of *Hevea* in French Equatorial Africa. (Conclusion).]—*Agron. trop.*, 8, 3, pp. 229–285, 42 figs., 1953.

Diseases of *Hevea* rubber found in French Equatorial Africa [*R.A.M.*, 32, p. 507] include several new to science. *Didymella heveana* n.sp. was found at Komono, Middle Congo, on living leaves bearing amphigenous, brownish to reddish-grey, irregular or round spots 1 to 3 cm. in diameter, bounded by a thin marginal zone. Sometimes the spots became confluent, covering a large part of the blade. The perithecia were 100 to 120 μ in diameter, the asci 60 to 80 by 8 to 10 μ, and the ascospores 13 to 17 by 2·5 to 4·5 (mean 15·3 by 3·7) μ.

Gloeosporium albo-rubrum [cf. ibid., 30, p. 541; 31, p. 206] was found on several occasions, especially at Oyem in Gabon, where two plots of four-year-old Avros 49 and 50 clones were severely affected. Young leaves at the ends of the diseased shoots became detached from the petioles and fell in masses, leaving the trees bare. New leaves were attacked as soon as they appeared. The fungus also attacked young rubber and nursery seedlings in the Terres Rouges plantation in Ubangui-Chari, at Boukoko, and in the M'Bila plantation, Middle Congo. Affected branches should be cut out and fallen leaves burnt. *Helminthosporium heveae* [cf. ibid., 31, p. 422; 32, p. 397] is widespread in all rubber plantations locally, infection being intense throughout the year, especially in the rainy season. It was also present in the Dizangué plantation, French Cameroons.

Leptosphaeria heveae n.sp. was found on living rubber leaves at M'Bila, bearing necrotic, mostly isolated, irregular spots; when confluent they measured up to several cm. in diameter, and sometimes covered almost half the leaf blade. Greyish-brown, later ash grey, on both surfaces, they were surrounded by a rather wide purple-brown edge. Numerous isolated or gregarious, black perithecia developed on the lower surface. Affected leaves turned yellow and fell. The perithecia measured 100 to 140 μ in diameter, the hyaline, claviform, briefly stipitate asci measured 60 to 75 by 12 to 13 μ, and the fusiform, incurved, 5-septate ascospores, hyaline at first, dark brown when mature, had blunt extremities, and measured 24 to 30 by 4·5 to 5 (mean 27·3 by 4·6) μ.

Mycosphaerella heveicola n.sp. was found on several occasions on living and dead leaves at Boukoko and M'Bila. It produces numerous necrotic, amphigenous, irregularly distributed, yellow, later greyish-brown, scattered spots which later may become irregular. They have a dark, narrow border and average 0·5 to 1 cm. in diameter; when confluent they may cover a large part of the surface. The brownish-black, epiphyllous perithecia measured 60 to 80 μ in diameter, the asci 38 to 50 by 10 to 13 μ, and the ascospores 13 to 19 by 4 to 5 (mean 16·2 by 4·5) μ.

The stems of dead, one-year-old rubber seedlings in the Terres Rouges plantation at Ubangui-Chari bore *Phoma heveicola* n.sp., the pycnidia of which were 100 to 140 by 120 to 160 μ and the spores 10 to 13 by 4 to 5 μ. The fungus attacks weakened

plants, which should be burnt when affected. The vigour of nursery seedlings should be improved by manuring and good cultural practices.

Phyllosticta heveana n.sp. was found on several occasions on living leaves, especially in the experimental plantations at Boukoko and Komono. It produces necrotic, round spots 2 to 3 mm. in diameter. They enlarge rapidly and become irregular in shape. The affected tissue is thin and bears the black fructifications, scattered irregularly in small groups. Several spots may become confluent but the lesions do not generally exceed 4 cm. in diameter. A narrow, yellowish margin separates the healthy from the affected tissue. When infection is severe the blade loses colour, dries, and falls. The pycnidia measured 100 to 140 μ in diameter and the usually ellipsoidal, sometimes reniform pycnidiospores 8 to 13 by 5 to 7·5 (mean 10·7 by 5·9) μ. No serious outbreak has so far been observed.

Phyllosticta heveicola n.sp. was first found in 1949 at Oyem, where the clones Avros 49 and 50 were severely affected. It was also found in a milder form at Kango. At Boukoko and Komono it occurs sporadically. Both surfaces of affected leaves bear reddish-brown, round or irregular spots 2 to 3 mm. in diameter, enlarging up to 3 cm.; the centre loses colour and the wide reddish-brown border is more conspicuous on the upper surface than on the lower. These necrotic, sparse, irregularly distributed spots may become confluent, forming large, irregular lesions, and cause the dried-up leaf to fall prematurely. The pycnidia measured 100 to 130 μ in diameter and the pycnidiospores 3·8 to 7·5 by 2 to 2·5 (mean 5·7 by 2·3) μ. At Oyem the damage caused appeared to be rather serious. Affected leaves should be burnt or buried and nursery seedlings should be treated preventively with copper sprays.

Physalospora heveae n.sp. was probably the cause of the death of branches on trees at M'Bila and Boukoko. They bore numerous swellings with a black spot in the centre. The perithecia measured 150 to 200 μ in diameter, the asci 50 to 65 by 10 to 13 μ, and the straight, generally slightly curved, subovoid to claviform ascospores with obtuse extremities, colourless at first, subhyaline when mature, measured 15 to 22 by 4·5 to 6 (mean 18·5 by 5·6) μ. Affected branches should be removed and burnt.

Other pathogens recorded include *Ganoderma pseudoferreum* [C.M.I. map No. 98], *Fomes lignosus* [cf. *R.A.M.*, 31, p. 423], *F. noxius* [ibid., 27, p. 382; C.M.I. map No. 104], *Sphaerostilbe repens* [cf. *R.A.M.*, 31, p. 399] present in Gabon and Ubangui, and *Ustulina zonata* [loc. cit.], which is widespread in every rubber plantation in French Equatorial Africa; it attacks rubber trees of all ages, particularly those three years old or more. In 1949 60 per cent. of the grafted trees four or five years of age at Boukoko were killed by the disease. A list of 110 references is appended.

MUNNECKE (D. E.). **Chemical soil treatments for plant disease control.**—*Pacif. Cst Nurserym.*, 10, 11, pp. 13–14, 30–31, 1951. [Received 1953.]

An account is given of various methods of soil sterilization [cf. *R.A.M.*, 32, p. 339], including steaming and the use of chloropicrin [ibid., 32, p. 518], formaldehyde [ibid., 32, p. 398], and methyl bromide [ibid., 31, p. 269].

ROISTACHER (C. N.). **Methods used in sterilizing nursery flats.**—*Pacif. Cst Nurserym.*, 11, 5, pp. 17, 34–36, 1952. [Received 1953.]

Directions are given for sterilizing nursery flats by steaming (six methods) and by the use of formaldehyde [see preceding abstract], either by dipping (2 per cent. solution) or by spraying with a knapsack sprayer. Flats, benches, and adjacent woodwork should be kept wet and well aerated for at least two days before planting to prevent the formation of paraformaldehyde. Copper naphthenate has proved toxic even after six months.

WAKSMAN (S. A.). **Soil microbiology.**—vii+356 pp., 72 figs., 1 diag., 57 graphs, New York, John Wiley & Sons, Inc.; London, Chapman & Hall, Ltd., 1952. 48*s*.

Broadly speaking, this book, which follows the general lines of two previous volumes, 'Principles of Soil Microbiology' [*R.A.M.*, 11, p. 470] and 'The Soil and the Microbe' (John Wiley & Sons, 1931), presents a discussion of the microbiological population of the soil; the mutual interrelationships among micro-organisms; the decomposition of plant and animal residues and the formation of humus; the transformation of various elements essential for plant growth; and the general applications of soil microbiology to other fields of knowledge, notably plant nutrition and soil formation. Of particular interest are table 63 on 278, portraying the antagonistic inter-relationships among different fungi, and chapter 13 (pp. 282–302), dealing with disease-producing micro-organisms in the soil and their control.

BAUMEISTER (W.). **Mineralstoffe und Pflanzenwachstum.** [Mineral substances and plant growth.]—viii+176 pp., Jena, Gustav Fischer, 1952. [Abs. in *Agric. Lit. Boron* 18, p. 11, 1952.]

Chapter IV (pp. 113–148) of this book on trace elements in plants and their physiological significance deals with the diseases produced by deficiencies and excesses of these elements [cf. *R.A.M.*, 32, p. 508].

SHEPHERD (C. J.). **Green manuring. A study of the effects of green manuring on the micropopulation of the soil.**—*Rhod. agric. J.*, 49, 4, pp. 198–202, 1952.

A study at the Agricultural Experimental Station, Salisbury, Southern Rhodesia, to compare the soil micro-population in plots growing green manure and maize in alternate years and in those with maize continuously demonstrated that green manuring increased crop yield, stimulated the growth of antibiotic-producing organisms, and reduced the number of bacteria, this decrease being correlated with an increased number of moulds and actinomycetes.

WILTGEN (N.) & BONNIER (C.). **A propos de l'examen mycologique du sol : description d'une méthod** [On the mycological examination of the soil: description of a method.]—*Bull. Inst. agron. Gembloux*, 20, 3–4, pp. 391–396, 2 figs., 1952. [Received June, 1953.]

An improved method for the comparative study of moulds in different soils is described. A specimen quantity (5 gm.) of finely powdered, air-dry soil is suspended in 10 ml. of sterile water and 0·2 ml. is pipetted into a Petri dish into which a rose bengal soil agar medium is poured. The contents of the dish are homogenized and then incubated at 27° C. for four days. This method eliminates ubiquitous species, the development of which on a culture medium gives a misleading impression of the fungal population of a soil. Particles of mycelium attached to soil are generally lost when the dilution method is used. When the author's method was applied in 20 tests to each of two types of soil all 20 dishes of each soil presented the same appearance, and in 16 there was one colony only of *Aspergillus niger*, this fungus not being present in the other four.

STAPP (C.). **Untersuchungen über Aktinomyzeten des Bodens.** [Studies on soil actinomycetes.]—*Zbl. Bakt.*, Abt. 2, 107, 8–10, pp. 129–150, 3 figs., 1953.

Soil samples, mostly but not exclusively of European origin, cultured on Conn's glycerin-asparaginate agar at the Brunswick branch of the Biological Institute, yielded 477 strains of *Streptomyces*, of which 31 per cent. were grey, 19 per cent. yellow, 18 per cent. brown, 17 per cent. white, 8·4 per cent. red, 4·2 per cent. blue,

1·3 per cent. green, and 0·8 per cent. black [cf. above, p. 540]. Gelatin was liquefied, after periods up to a few weeks, by all but one of the isolates. Urea was a good to very good source of nitrogen for 177 strains and uric acid for 197, while 199 made moderate to good growth with hippuric acid. None of the isolates was capable of fixing even a trace of atmospheric nitrogen in a nitrogen-free medium. The sporophores of the great majority of the isolates examined were straight, only 60 being sinistrorse and three dextrorse.

Noronha (E. de A.). **Contribuïção para o estudo da Melampsora ricini Passer. em Portugal.** [Contribution to the study of *Melampsora ricini* Passer. in Portugal.] —*Agron. lusit.*, 14, 3, pp. 229–247, 2 pl., 1952. [English summary.]

In greenhouse inoculation experiments at the National Agronomic Station, Sacavém, Portugal, covering the period from 1945 to 1948, *Melampsora ricini* [cf. *R.A.M.*, 32, p. 120] proved to be pathogenic to *Euphorbia obtusifolia*, *E. ipecacuanha*, *E. geniculata*, and *E. marginata*, besides 24 strains and varieties of *Ricinus communis*. The hitherto undescribed teleuto state of the rust, which developed on both leaf surfaces of *E. marginata* about a month after inoculation, consisted of sparse, brownish-black, roughly circular sori, surrounded by a chlorotic ring, and prismatic, thin-walled spores with rounded ends, 26·4 to 48 by 3·6 to 12 μ, typical of *Melampsora*. Isolates of *M. euphorbiae* sensu lato from five species of *Euphorbia*, including *E. peplus* [cf. ibid., 14, p. 53], failed to infect *R. communis*.

Information is briefly presented on the history and geographical distribution of the rust.

Armstrong (Joanne K.) & Armstrong (G. M.). **Fusarium wilt of Sesame.**— —*Plant Dis. Reptr*, 37, 2, pp. 77–78, 1953. [Multilithed.]

Sesame wilt, caused by a species of *Fusarium*, was observed in 1948 on a plantation in south Georgia (*Phytopathology*, 40, p. 785, 1950). In inoculation experiments by methods already described [*R.A.M.*, 28, p. 189], with isolates from wilted plants, most of the varieties and breeding lines tested proved susceptible with the exception of Sirogona, which was highly resistant. The sesame *Fusarium* could not be differentiated from *F. vasinfectum* morphologically or culturally, but it was quite distinct in pathogenicity, failing to cause wilting of any other plant inoculated. *Fusarium* isolates from 19 other hosts did not attack sesame. It is suggested that the use of the names *F. vasinfectum* and *F. v.* var. *sesami* for the sesame fungus is misleading and should be discontinued.

Twenty-second Annual Report of the Sugarcane Research Station, Mauritius, 1951. —37 pp., 1952.

In part III (Botany Division, pp. 26–32) of this report [cf. *R.A.M.*, 32, p. 214] B. Nundloll states that aretan and agallol (Farbenindustrie, Germany), both at 1 per cent., were equally effective as sugar-cane disinfectants against pineapple disease [*Ceratostomella paradoxa*: loc. cit.; ibid., 32, p. 511] in three trials at Reduit, Plaines Wilhems, and Pamplemousses Experimental Stations. The mean number of infected cuttings out of 180 was 25 for aretan and 28 for agallol, as against 106 for the untreated.

Revilla (V. A.). **Algunos resultados de las investigaciones sobre la nueva enfermedad de la Caña de Azúcar en el país.** [Some results of the investigations on the new disease of Sugar-Cane in the country.]—*Inf. Cent. Invest. agríc., Lima*, 76, 8 pp., 3 figs., 1 map, 1952. [Multilithed.]

A hitherto undescribed species of *Sclerospora* is believed to be responsible for a disease of sugar-cane recently observed in Peru [*R.A.M.*, 32, p. 339]. The

clustered shoots attain a height of only 40 to 50 cm. in five months compared with the normal 1 m. The leaves bear pale stripes extending over their entire length. The stem galls are believed by J. P. Martin to be distinct from those associated with stem gall [cf. ibid., 30, p. 344] in Hawaii [ibid., 29, p. 55].

The spore dimensions of the new *Sclerospora* differ from those of all other known species, the zoosporangia measuring 66 to 81·9 by 39 to 54·9 μ (100 measured) and the oospores 28 to 39·9 μ in diameter (500).

DIAS (MARIA R. DE S.) & DA CAMARA (E. DE S.). **Fungi Lusitaniae I.** [Fungi of Portugal I.]—*Agron. lusit.*, 14, 2, pp. 101–125, 4 pl., 1952.

This list of Portuguese fungi [*R.A.M.*, 32, p. 511 and next abstract] contains 45 new records for the country, including a new genus, 14 new species, a new form, and a new name. Interesting records are *Puccinia helianthi* on sunflower [C.M.I. map No. 195], *Phomopsis viticola* on vine, *Ascochyta pisi* on pea [ibid., No. 273], and *Septoria lycopersici* f. *italica* on tomato [cf. ibid., No. 108].

LUCAS (MARIA T.) & DA CAMARA (E. DE S.). **Fungi Lusitaniae II.** [Fungi of Portugal II.]—*Agron. lusit.*, 14, 3, pp. 193–227, 2 pl., 1952.

Among the six new species in this annotated list of Portuguese fungi [see preceding abstract] are *Dothiorella syringaecola* in association with *Phoma forsythiae* (a new record for Portugal) on lilac branches, *Macrophyllosticta heterospora* on *Smilax asper* leaves, and *Phomopsis hydrangeae* on *Hydrangea hortensis* branches.

D. syringaecola is characterized by black, globose pycnidia, 130 to 170 by 120 to 150 μ, roughly cylindrical, straight, hyaline conidiophores, 8 to 10 by 2 to 2·5 μ, and ellipsoid or navicular, straight, continuous, greyish-blue conidia, rounded at both ends and measuring 17 to 23 by 5 to 8 μ. The erumpent pycnidia of *M. heterospora*, 230 to 300 μ in diameter, are furnished with a thick, black excipulum; the papillate, very stout, hyaline conidiophores measure 6·5 to 8 by 3 to 4 μ and the irregularly-shaped, straight, continuous, hyaline conidia, rounded at both ends, 24·5 to 27 by 10 to 11·5 μ. *P. hydrangeae* produces globose to depressed, intensely black pycnidia, 120 to 200 by 70 to 100 μ; filiform, fasciculate, erect, hyaline conidiophores, 13 to 15·5 μ in length; and ellipsoid, sometimes unequal, straight or occasionally curved, biguttulate, continuous, hyaline conidia, 8 to 10 by 2·5 to 3 μ, tapering at both ends.

The list includes 71 records new to Portugal.

BAZÁN DE SEGURA (C[ONSUELO]). **Plant diseases new to Peru.**—*Plant Dis. Reptr*, 37, 2, pp. 121–122, 1953. [Multilithed.]

Among the diseases listed [cf. *R.A.M.*, 31, p. 208] are *Heterosporium allii* on onion [ibid., 29, p. 222], *Macrophomina phaseoli* on sour orange [ibid., 29, p. 616], *Sclerotium rolfsii* on *Solanum andigenum* [ibid., 28, p. 641], and *Phytophthora cinnamomi* on papaw and *Ocotea architectorum*.

HINO (I.). **The fungi collected in Misima Island.**—*Bull. Fac. Agric. Yamaguti Univ.* 2, pp. 114–120, 1 map, 1951. [Received May, 1953.]

This list of fungi collected in May and August, 1951, on Misima Island, off Yamaguti, Japan, contains representatives of 27 families and all classes.

IMAZEKI (R.). **Contributions to the fungous flora of Eastern Asia (1).**—*Bull. For. Exp. Sta. Meguro* 42, 10 pp., 1 pl., 2 figs., 1949. [Japanese, with English summary. Received June, 1953.]

This is an annotated list of seven polyporous fungi, two of them new, collected in Japan and other parts of eastern Asia.